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Machinery Sales In Russia

By NELSON W. PICKERING

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**A Well-Considered and Unbiased Report of a
Leading Machinery Builder About His Experi-
ence in Doing Business With Soviet Russia.**

IN 1923 the Soviet Government of Russia decided on a plan of industrial expansion far beyond anything that has ever been put into effect or probably even dreamed of in the history of Man. A country which was primarily agricultural, and had but few sources of supply within its boundaries for industrial equipment, undertook to erect plants which would supply its vast population with fabricated goods; and when that colossal task had been completed, to export such materials to the rest of the world, primarily to the Far East. Such a plan required the purchase of engineering brains and engineering equipment from countries which had made great advances in those lines.

Commissions were sent from Soviet Russia to report upon the various sources of supply. It was quite natural that they looked most favorably upon the United States, feeling that that country had, more recently than the others, solved a problem somewhat similar to that which faced Russia; that the United States has great areas; natural resources such as minerals and woods; that transportation facilities were built to meet the necessity of traveling long distances rather than the short distances of Europe; that its agricultural products were somewhat similar; and that it stood above all other countries in the world in the matter of mass production. And mass production above all else, was what the Russians had in mind.

In the last four years before the World War, the exports from the United States to Russia averaged approximately \$24,600,000 per year. In the Soviet fiscal year ending October, 1924, the exports from the United States to Soviet Russia amounted to nearly \$44,000,000 per year and climbed steadily until they reached the peak of nearly \$150,000,000 in the Soviet fiscal year ending

October, 1930. These exports were largely machine tools or special machinery required for the large Russian developments. The purchase of these tools was handled by the Amtorg Trading Company, Incorporated, which is a Soviet organization set up in New York primarily for that purpose, although Russian imports to this country are handled by the same organization.

The companies which have dealt with the Amtorg Trading Corporation have found that they live up



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to their agreements and are most particular in the matter of payments, once the terms have been arranged. However the long terms requested by Russia have been a serious obstacle for many American companies, particularly as the

United States Government has not recognized Russia, nor will it assist in any way with long term financing. This is in contrast with the attitude of Germany, England and



Part of the Experimental Aluminum Works in Leningrad*

Italy, which countries have guaranteed their manufacturers a certain percentage of the net price in the form of an insurance, and have done everything in their power to bring to their countries the valuable Russian trade.

It is not the purpose of this article to discuss the political entanglements and their effect upon the business which the United States has or might have had, although that subject could well be discussed at length.

During the past winter the writer had the pleasure of making a business trip to Russia for the purpose of studying, first hand, the degree of success which has been made by the Russian plants, under what is known as a "Five Year Plan," and to arrive at an opinion as to the possible future business to be obtained. Many plants were visited, primarily in the rubber industry, and the degree of development was far above what had been imagined. Some of these plants had been increased nine times within the past three or four years and the plans for future expansion were almost unbelievable. One is impressed by the careful analysis made by the Russian authorities as to the consumption of the products from these factories; and when it is appreciated that there are about 165,000,000 people in Russia, many of whom are on a very low scale of living, it is quite apparent that a potential demand exists within the country for the large production which is now being delivered and which is still further planned.

The large automobile plant at Nizhny Novgorod is particularly interesting. It is understood that the machine shop at that plant is the largest single shop in Europe. The machinery is of the most modern type and, as in the rubber factories, it is principally of American make. Throughout Russia the highest praise of American machinery was heard, and where other machinery had been purchased there was usually the explanation that such

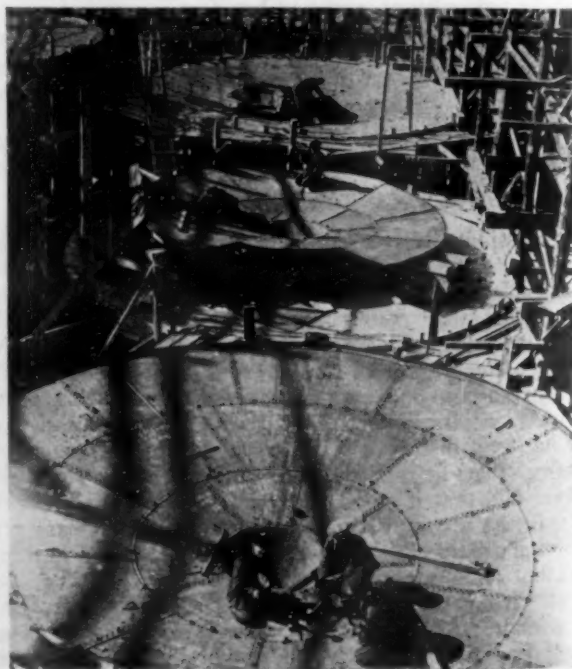
machinery was bought for political or for credit reasons.

The actual selling of machinery in Russia itself is difficult if not impossible. There are very many government departments, so interlocked that apparently approval must be obtained from many of them; and when such approval is obtained the purchase must be made by the Amtorg Trading Corporation in New York.

Nevertheless there is undoubtedly an advantage to American machinery builders in visiting Russia and interesting the engineers and the "Trusts" in their type of machinery. The engineers and officials are most friendly to American goods and anxious to learn, and if a special or new type of machine can be brought to their attention it is quite probable that ultimately a purchase license for such a machine will be sent to New York. The fact that so much delay occurs is apt to be discouraging and lead one to believe that the cost of a visit to Russia returns no dividends. The writer is of the opinion, however, that such a visit is most valuable, through the greater understanding given to American business men of the actual Russian conditions and the great field existing for their products.

As far as possible full information in regard to the operation of machines which are sent to Russia, should accompany them. It must be appreciated that there is a large percentage of unskilled labor to which the machines are exposed. This difficulty is being overcome, however, through an excellent trade school education being given in connection with all factories. The next generation of Russian workmen will be able to average well with the workmen of other nations. The fact that Russia is giving more attention to education in the trades than in the classics is a proof of their serious intention of placing Russia among the leading industrial nations. Provided there are no political upsets, a reasonable number of years should make them able to supply their own industrial requirements, although the writer does not believe that they will be a serious factor in the world trade in many lines for years to come.

As mentioned above, the long term credit requested by Russia is the most serious difficulty in the sale of machin-



Laying the Foundation of a Section of the Dnepropetrovsk Aluminum Plant*

*Illustrations furnished by courtesy of the Amtorg Trading Corporation, New York, publishers of "The Economic Review of the Soviet Union."

ery from this country. These requests are caused principally by the Soviet's desire to obtain machinery as quickly as possible, without waiting for the time when the money will be available. If they can put a machine into operation a year before it is paid for they can get production from that machine and increase the output under their plan. Long term credits abroad are always risky, but recently we have found many short term credits at home even more dangerous. The Russian policy is to estimate their income for a period and to obligate that income for the purchase of foreign equipment. The fact that they have not defaulted on a single item since the institution of this plan in 1928 shows that their financial forecasting is satisfactory. At the time of the writer's visit, he was told that all moneys of the 1932 income had been obligated and that any purchase of machinery must be paid for out of 1933 earnings. This was explained by one of the highest officials of the Finance Department of the Soviet Government, and one cannot help but be impressed with the fact that they are buying only to the extent which can be covered by a reasonably sure income.

When it is appreciated that every product of Soviet Russia belongs to the State, it will be seen that it is well within their power to control their finances without the uncertainties attached to the medium of taxation.

A serious threat to American sales of machinery is the lack of importation of Russian goods. In an interview with an important Russian official, the writer was

informed that Russia would be obliged to buy goods only where she could sell her products, and that it was her object to have a favorable trade balance in all countries. Furthermore, international exchange is in such shape that it would be a severe disadvantage to Russia to sell its goods in some European country and then transfer the money received into dollars for the payment of American machinery. In other words, the export of the American machinery to Russia has been seriously hurt by:

(a) Legal or moral embargoes on Russian goods sent to this country.

(b) International exchange.

This is proved by the fact that, from a total of nearly \$150,000,000 worth of goods exported to the Soviet during the fiscal year ending October 1, 1930, exports dropped to \$51,000,000 for the calendar year of 1931; and these figures are still further dropping for 1932.

Irrespective of our ideas on government, we must recognize that there is, about 5,000 miles away, a country which can absorb a large quantity of our products, particularly machinery, and that if it does not purchase American machinery it will purchase from some other markets in the world. It may be more patriotic, and much more sensible, to keep our factories busy and our men employed, through making machinery products for Russia, than through taking on an attitude of aloofness and permitting the other nations of the world to take profitable business away from us.

Recommendations for Buyers of Non-Ferrous Castings

THE American Foundrymen's Association submitted to the National Association of Purchasing Agents' in September, 1931, Recommendations for Buyers of Castings. The following report with revisions, the committee believes will receive the approval of the American Foundrymen's Association.

Information for Buyers to Supply

Inquiries from buyers of castings should give the following essential information.

1. Kind of metal. Specify whether virgin, remelted, or secondary metal may be used.

2. (a) Sample casting, or (b) Detailed drawing showing:

Actual or estimated weight of the casting.

Important dimensions, dimension tolerances and machined surfaces with amount of finish to be allowed.

Special requirements, such as finish, testing, gauging, special tolerances, disc or special grinding, etc.

Specific location, if any, for symbol number, pattern numbers and trade marks, and whether raised or sunken symbols are preferred.

3. Number of pieces to be ordered of each pattern with delivery dates and schedules.

4. Description of available pattern equipment and its condition, indicating:

(a) Type of pattern:

Loose (number of patterns and if suitable for mounting on plate)

Gated (number on gate)

Plated (number on plate)

Machine, cope and drag (number on equipment).

(b) Material from which pattern is constructed:

Wood, Brass, Aluminum, White Metal.

(c) Number of cores per casting with kind and type of core boxes:

Number of cores to each box

Material from which core box is made

Whether designed for core blowing machines

Number and kind of core dryers.

5. If no pattern is available and foundry is to make pattern at customer's expense, customer should state whether substantially permanent patterns are to be constructed. If foundry is not to make pattern, would it have the opportunity to suggest how pattern should be made? If buyer is to furnish flasks, the size, type and construction should be given.

6. Description of the service or use of the casting. If the castings are to be subjected to pressure, give test to be made and method of making. Specify if test bars will be required in accordance with specifications published by the American System of Testing Materials for Castings, and by whom and where inspection or test will be made.

7. State whether pound, lump sum or piece price is desired, and F.O.B. point. Also if separate price is desired on pattern equipment.

8. Indicate any special crating, marking or packing. In addition to the foregoing information which inquiries for castings should show, and which is considered common to all kinds of castings, the following information has special application to specific kinds of castings.

1. Physical and chemical specifications desired and tolerances permitted.

2. Are there any royalties to be paid by foundry?

3. Are castings to be heat treated, machined or to receive any special treatment, such as for plating, etc.?

A Specialist in the Production of Difficult Alloys

The Riverside Metal Company Has Concentrated for 35 Years on the Production of High Grade Nickel Silver and Phosphor Bronze. Their Products Are Peculiarly Suitable for Subsequent Metal Working, Plating and Finishing Operations.

THE Riverside Metal Company of Riverside (Burlington County), N. J., is a specialist in the production of nickel silver and phosphor bronze in the form of sheets, wire, rods, strips, circles, blanks and bars. They make in addition, however, all other non-ferrous alloys in the above forms, to order, to the specifications of the users, such as brass, commercial bronze, bronze welding rod, Gilding metal, Platers' metal, Optical bronze, shot copper and cupro-nickel. The bulk of their output, however, consists of nickel silver and phosphor bronze and on these two classes of alloys the company has concentrated since its inception in 1897.

It is a fixed principle with the Riverside Metal Company that its output must conform to rigid specifications. Compositions have a tolerance of only plus or minus one per cent. The material must be up to standard for tensile strength, elongation, hardness (Brinell, Scleroscope and Rockwell); and last but perhaps most important of all—for grain size. This point will be taken up later and its importance shown to the users of rolled and drawn materials which are subsequently fabricated into finished articles.

History of the Company

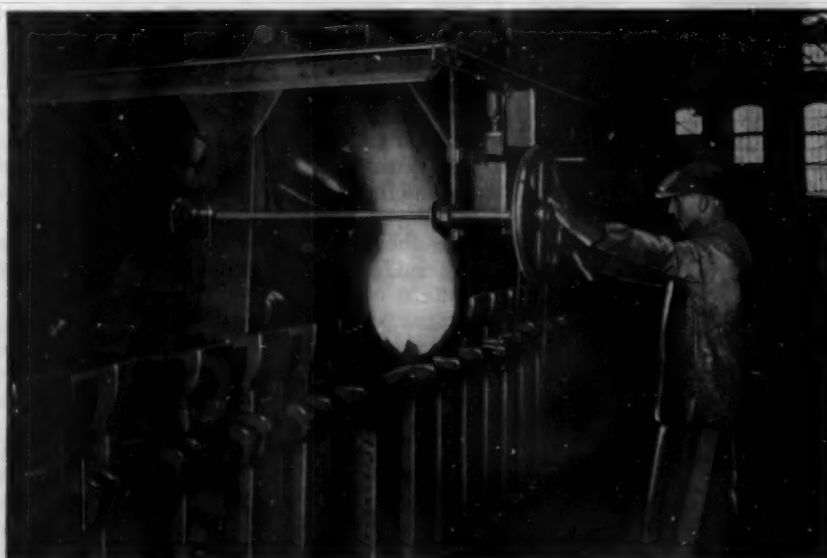
The Riverside Metal Company was formed in 1897, in order to provide the Keystone Watch Case Company with a dependable source of supply for its metals. For a num-

ber of years the Keystone company absorbed a large part of the production of the Riverside company. However, in latter years, the Riverside Metal Company has expanded to such an extent that the Keystone company, although it is the largest producer of watch cases in the world, now takes only a small part of the output. The rate of growth of the Riverside company can be judged by the fact that its production has increased over 1800 per cent in the 35 years of its existence.

In 1930, two important additions were made to the rolling mill. A breaking down mill was erected, 600 ft. x 100 ft., which contained among other new equipment, two stands of 24-inch, 2-high mills which increased the production of the plant from 15 to 20 per cent. A new and greatly enlarged laboratory was built and equipped for testing in every fashion. As a result the company has achieved not only volume but quality in its output. The present capacity of the mill is 1,500,000 pounds of metal per month. In normal times 500 people are employed. The plant covers 192,639 square feet, or about 4.42 acres under roof.

Plant and Methods of Production

The technical set-up of the plant is similar, in general, to that of other mills of the same type, except that a number of very interesting and ingenious improvements have



**POURING RIVERSIDE
NICKEL SILVER FROM AN
ELECTRIC MELTING
FURNACE**

Since the advent of the Ajax-Wyatt electric furnace, the Riverside Metal Company has utilized its great advantages and has equipped practically its entire casting shop with this type of furnace.

been developed for eliminating hand labor and speeding up the movement of materials in the various departments. The raw material consists of Lake and electrolytic copper, high grade zinc, electrolytic and shot nickel, phosphor copper of the highest grade, manganese and the usual minor constituents, such as fluxes, etc., which enter into the alloying of the metals. These are stored in special bins from which the metals are drawn for weighing to make up the batches which go to the melting furnaces.

The melting equipment consists essentially of a battery of Ajax-Wyatt electric induction furnaces with which readers of *THE METAL INDUSTRY* are all familiar as this type of furnace has been described many times in our columns. The Riverside Metal Company was the first successfully to use this melting method for nickel silver and other high-temperature alloys. The furnaces are of the standard type, 600 pound capacity, with special linings to withstand the temperatures involved in melting the special alloys produced. It is a part of the control system of the plant that a sample of every melt is taken and checked carefully for composition (plus or minus one per cent) before the batch is allowed to go through into the mill. In that way no material of faulty composition can get into production. A battery of crucible pit furnaces is used for smaller lots of special mixtures.

The alloys are cast into flat bars or rounds, depending upon the requirements (sheet or wire) and then taken to the breaking down rolls. The breaking down operation is then followed, in the case of both flats and rounds, by a milling operation which removes all scale, oxides and other surface impurities. This is an expensive operation but it more than pays for itself in the elimination of

rejects and returns. After milling, the slabs are run down to various thicknesses as required, with intermediate anneals, pickles, washes, etc., until they go to the slitting and finishing operation, being cut to the necessary widths and lengths required. A rigid inspection precedes final packing and shipping.

The rounds, are drawn down through various dies, going from cast iron dies to steel, tool steel and finally diamond dies for small sizes. Some of the wire (phosphor bronze) is tinned, as is also some of the strip. The wire is then coiled or spooled as required, inspected and packed for shipment. The wire plant includes the usual annealing and pickling operations, but an interesting feature is a Kenworthy electric annealing furnace which entirely eliminates the scale ordinarily produced in an annealing operation and reduces substantially the amount of subsequent pickling. This not only cuts costs but improves the quality of the wire.

Extra large widths of sheet are also produced and these are subjected to a special leveling process which eliminates buckling. The sheets are then polished and cut to required sizes, shapes, etc.

On the heavy bars, the operations include sawing and milling on the surface edges and ends.

The rods, after the original breakdown are, of course, handled in the same fashion as if they were to be drawn into wire, but the operations stop at the requisite diameter. The bars are sawed off to correct lengths, the ends chamfered and finished. The rods are straightened before packing.

The mill has a large output of flat wire with round or square edges in both nickel silver and phosphor bronze.



AIRPLANE VIEW OF THE MILL AND GENERAL OFFICES OF THE RIVERSIDE METAL COMPANY, RIVERSIDE, BURLINGTON COUNTY, N. J.

Laboratory Control

The control laboratory is one of the most important departments in the plant. It consists of three divisions.

1. **Chemical.** A chemical analysis is made of the raw material and melting batches. In addition, a large number of outside samples are analyzed for customers so that the mill can meet special specifications as required.

2. **Physical.** In this laboratory, tests are made for hardness, tensile strength and ductility. Three types of hardness are determined, namely, Brinell, Rockwell and

widely diversified number of industries in which its products can be used. Phosphor bronze goes into electrical, radio and mechanical appliances; heating unit diaphragms; paper mill and mine machinery parts; Fourdrinier wire screens; oil well machinery; textile ring travelers; binding wire; bearings and bushings; automotive ignition systems; springs requiring utmost resiliency; bridge bearing and expansion plates; marine parts coming in contact with salt water; thermostatic base metals; screw machine products; welding.

Nickel silver is most widely used for base metal for



A CORNER OF THE METALLOGRAPHIC LABORATORY

This laboratory is equipped with two modern metallurgical microscopes, all the necessary apparatus for preparing specimens and a fully equipped dark room. This department has electric furnaces for the investigation of the effect of annealing and heat treatment; also a melting furnace for research in the development of new alloys.

Scleroscope. In addition electrical properties, such as resistance, are determined.

3. **Metallographic.** Rigid control is exercised over the grain size of the output. This is one of the most important features of the products made by the company.

4. **Research.** The laboratory staff is constantly at work on the development of new alloys and new products, striving for improved methods and even higher quality.

Uses of the Products

The Riverside Metal Company is fortunate in having a

plated ware; soda fountain, restaurant and allied food dispensing fittings and trim; architectural hardware; jewelers' findings and novelties; orthopedic appliances; etched and enameled name plates and escutcheons; musical instruments; cutlery; diaphragms; deep drawn or spun articles; electrical, radio and telephone springs; automobile and marine trim; store fronts; screw machine products; draughting instruments; slide fasteners; keys; electrical resistances; medals and tokens; optical goods; surgical appliances; stampings.

It is made in a variety of compositions, from 5 per cent nickel to 25 per cent nickel.

ONE OF THE BREAKING DOWN ROLLS IN OPERATION

Installation of heavy-duty rolling and handling equipment in the breaking down mill, which was erected and completed in 1930, has greatly increased production facilities. The roll illustrated reduces heavy bars from 1½ inches thick to about .300 thick.



Grain Size Control and Its Importance to Users

In the production of nickel silver, the control feature which the company has instituted is especially noteworthy—namely the regulation of grain size. Nickel silver is widely used in the production of articles which are subsequently plated and finished in various decorative forms.

out" is reduced to a minimum. Every plater knows that spotting out is caused primarily by imperfections in the base metal in which solutions lodge, and later, due to heat, humid atmospheres, etc., work their way to the surface, spoiling the fine plated and polished finish. Because of the careful control of the grain size of the sheet metal, this tendency is reduced to the lowest possible and the cost of

CHARGING ANNEALING FURNACE

Special care is exercised in the control of atmosphere within the annealing chambers to eliminate objectionable "fire coating."



It is well known throughout the manufacturing trade that the condition of the base metal is one of the most important factors influencing manufacturing operations, such as stamping, spinning, plating and polishing. A metal which contains pits and intergranular cracks offers great difficulties and often makes high grade work impossible. For that reason the Riverside Metal Company has set up the highest practicable standards for grain size. The metal turned out is specially fine grained, within the limits of workability and ease of operation, with pits and blemishes practically eliminated.

Keeping Down "Spotting Out"

The importance of this feature, particularly to plating shops is great. In the first place preliminary polishing operations are greatly lessened. Furthermore—and perhaps most important of all, the tendency of metal to "spot

finishing is consequently lessened. In addition the manufacturing processes mentioned above, such as spinning, stamping, etc., are also facilitated and their cost cut down by the fact that the metal is comparatively soft and easy to work.

Incidentally many customers of the company report that the use of fine grained 18% nickel silver results in extraordinarily fine chromium plated articles with a very low cost for plating, as the preliminary polishing operation is slight.

Special Services

The Riverside Metal Company offers, in addition, a number of special services to its customers. Due to its type of organization the company is in a position to offer unusual facilities to small orders as well as large. The customer receives individual attention and his require-



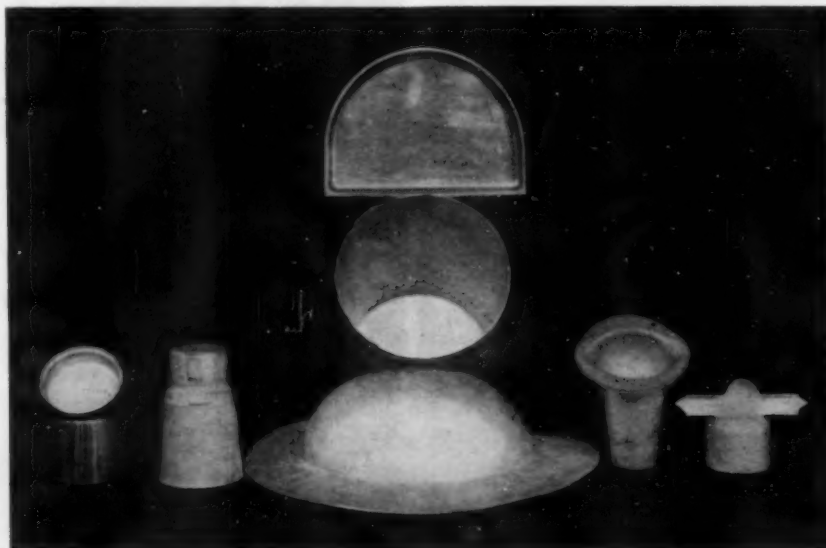
A SIX-BLOCK WIRE DRAWING BENCH IN OPERATION

On equipment of this kind nickel silver wire is drawn from .250 diameter to .100 diameter.

ments can be met with a minimum of delay. The company has four branch offices located, in New York, at 15 Maiden Lane; Chicago, 549 West Washington Boulevard; Hartford, Conn., 43 Farmington Ave., and Cleveland at 2036 East 22nd Street. Daily communication with these

tion, local shipments are sent out directly, as the company operates a fleet of trucks for nearby delivery.

The technical department of the company is at the service of customers to help them solve their own problems. Advice is freely given along the lines of design of finished



SEMI-FABRICATED PARTS MADE FROM RIVERSIDE NICKEL SILVER

Examples of semi-fabricated parts indicating how nickel silver lends itself to difficult drawing, spinning and stamping operations.

offices is maintained by the use of the new teletype machines. It is thus possible to give almost instantaneous attention to customers' wants. Rush orders offer no problem as the organization of the company is flexible enough to handle this type of business easily.

The shipping facilities of the company are excellent, as they are favored with a spur from the main line of the Camden Division of the Pennsylvania Railroad. In addition,

methods of manufacture, such as the mechanical processes involved, and suiting the base metal in composition and physical properties to the needs of the final article.

The personnel consists of men who have had long experience in the production of nickel silver and phosphor bronze, thus bearing out the statement of the company that its products are made by specialists who are experts in their field.

United Chromium Wins Patent Suit Appeal

THE appeal in the case of United Chromium, Inc., New York, versus The International Silver Company, Meriden, Conn., involving United States Patent No. 1,581,188 issued to C. G. Fink, has been decided. The United States Circuit Court of Appeals for the Second Circuit, on July 29, 1932, handed down a unanimous opinion holding all claims in suit valid. Infringement was held established as to all claims in suit, except Claim 16.

We are informed that the attorneys for the International Silver Company are studying the decision with a view to taking such steps as are left open, but that it is too early for them to make any statement about their plans at this time.

The text of the chromium patent decision will be published in our next issue.

Method of Preparation of Lead and Lead Alloy Cable Sheath for Microscopic Examination

BY W. H. BASSETT, JR., AND C. J. SNYDER*

Lead and lead alloy cable sheaths contain irregularities in grain structure that are best examined microscopically. Careful preparation of sheath samples is necessary because the grain structure of lead is very sensitive to "working." The microtome has been recommended for cutting a smooth surface but the authors obtain satis-

factory results by filing and polishing. All polishing is done by hand with a circular motion on emery paper and broadcloth backed by plate glass. Gasoline is used as a lubricant and cleaning medium.

Lead and lead alloys require different etching reagents. A table of reagents used by various authorities is given. The authors recommend etching solutions for lead, lead-tin and lead-antimony alloys. In all cases specimens must have sufficient etching to remove the surface layer of fine grains developed by cutting or polishing.

Examination of structures with vertical light is recommended. Suitable magnifications for lead are 5 to 75 diameters, for lead-tin alloys 20 to 200 diameters, and for lead-antimony alloys 50 to 500 diameters.

*A paper presented at the Thirty-fifth Annual Meeting of the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa., held at Atlantic City, N. J., June 20-24, 1932.

Adopting Modern Heat in the Brass Industry

By W. W. YOUNG

Connecticut Light and Power Company

With Particular Reference to the Practical Results That Have Been Obtained So Far in the Bright Annealing of Brass and Copper

FROM "INDUSTRIAL GAS," JULY, 1932

IT is my intention to discuss principally the practical results obtained so far in the bright annealing of brass and copper, wire and strip. It will not be my purpose to delve extensively into the metallurgy of the bright annealing processes, but to attempt to show that the bright annealing of non-ferrous metals is no longer a vague promise of optimistic furnace manufacturers, but an actual plant accomplishment.

Before discussing bright annealing, however, other novel applications of gas fuel in the brass industry might be discussed.

First might be mentioned the large, high-pressure, gas-fired muffle for annealing coiled sheet brass. A complete description including operating data on this furnace will be found in the December 26 issue of Gas Age-Record, so I will not go into details here. This furnace operates in competition with wood-fired muffles on finish annealing. The article in Gas Age-Record mentioned a consumption of 0.66 of a cubic foot of 530 B.t.u. gas per pound of brass for 24-hour operation. As low as 0.55 of a cubic foot per pound of brass has been obtained in test runs. The monthly consumption on this furnace approximates 2,000,000 cu. ft.

A second large application for gas in the brass industry is hot forging. One of the most modern brass hot forging departments in Waterbury is equipped with six Surface Combustion high-pressure, gas-fired furnaces and two electrics with gas curtains. This department was at one time completely equipped with electric furnaces. The main advantages of gas-fired equipment which enabled it to displace electric were lower cost of operation, greater speed, and, on certain types of forgings, less scale. This department during normal operation uses about 700,000 cu. ft. per month.

One of the brass companies in Waterbury has recently installed a large Surface Combustion furnace for annealing nickel silver tubes. This furnace is 70 ft. over all, consisting of a 35-ft. heating chamber and a 35-ft. spray quench cooling chamber. Maximum gas capacity is 4,200 cu. ft. per hour. As this furnace uses a recuperator, it is fired with low-pressure gas. A fuel saving of 10 to 20 per cent is claimed for the recuperator.

The furnace is of the semi-continuous pan puller type, the pans resting on alloy rails inside of the furnace. Although it is not equipped with a continuous belt or chain it is essentially a continuous furnace. As this furnace just started running recently there are no operating data available. Test runs indicate that nickel silver tubes annealed in the furnace have practically no nickel oxide. Consequently the expensive bichromate

dip is eliminated and a quick acid dip removes the discoloration.

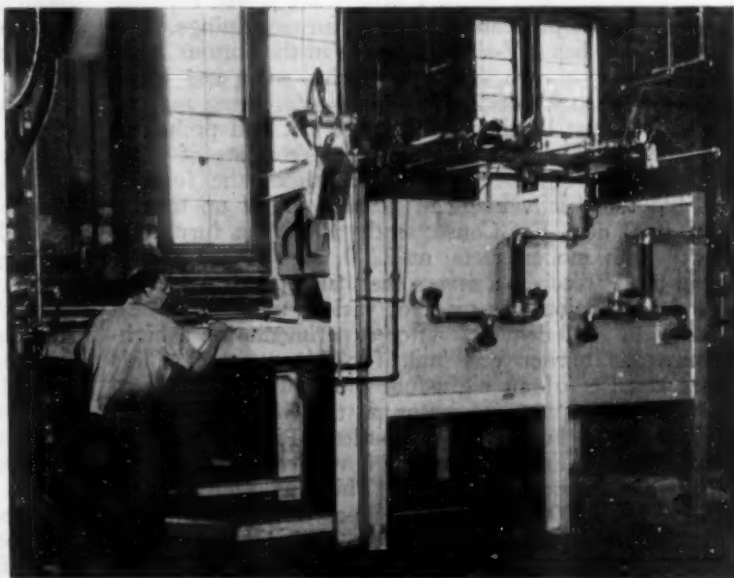
The estimated fuel consumption of this unit is approximately 1,500,000 cu. ft. per month.

This same plant has installed a gas-fired billet heater and converted an oil-fired brazing furnace to gas. The billet heater has three alloy chutes inside inclining slightly down toward the outlet end. Special brass, bronze, and nickel silver round billets up to eight inches long and five inches in diameter are heated in this furnace. They are then extruded in a press which automatically removes the thin outside shell of oxide. Gas firing was desirable in this furnace because of close control.

A plant in one of our other territories has a large continuous nickel silver shell annealing furnace with a spray quench which is operating very satisfactorily. It has been demonstrated, however, that brass and copper shells can be annealed in an open gas-fired furnace so that they can be satisfactorily redrawn without pickling, if they are not deep drawn. Deep drawn shells should be bright annealed to be redrawn without pickling.

As a matter of fact, one furnace was installed some time ago as an experimental unit consisting of a chain belt running over a set of 50 Johnson burners with nothing but a U-shaped brick arch over the burners.

Brass and copper shells can be annealed over these



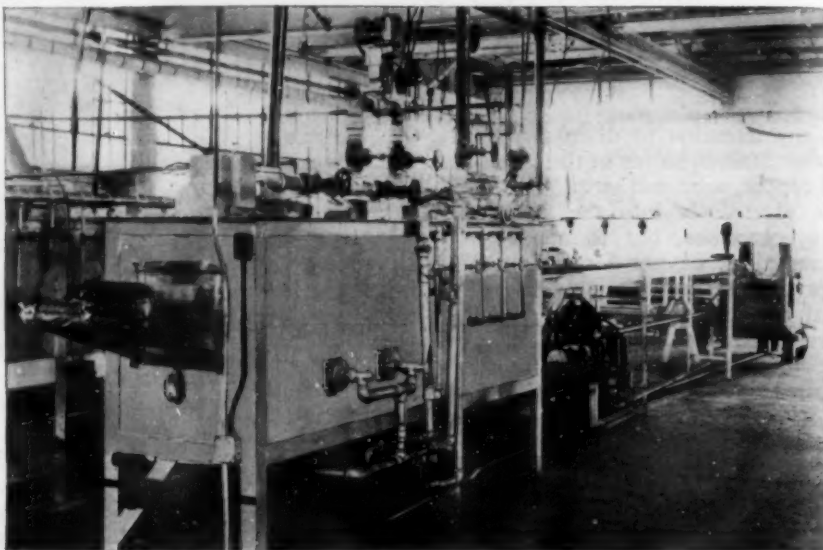
Gas-fired Hot Forging Furnace in Chase Companies, Inc. Hourly Capacity, 1200 lb. of Slugs.

burners, and the resulting surface is clean enough to enable them to be redrawn without pickling.

A common method of annealing difficult shell jobs is to pack them in large steel boxes with charcoal. This method is obviously expensive, costing about one dollar a thousand pieces for packing alone. This packing can be eliminated in gas-fired furnaces. Gas should prove very advantageous in the replacement of coal pit fires used for small casting jobs with gas-fired crucible melting furnaces. The speed of the gas furnaces and the location of the foundry will oftentimes give gas certain economic advantages. Eight of these coal-fired pit furnaces have re-

Another minor application which might be worth mentioning is the heating of extrusion blocks over shut-down periods. For those who are not familiar with the die block in an extrusion press a brief description might be made. It consists of a steel cylinder about four feet long, two and one-half feet in diameter, with an eight-inch opening through the center. This opening is lined with a special steel collar. As long as brass billets are being extruded through this block the block remains heated. However, during a shut-down the block must be kept up to a temperature of 900 deg. F. This is commonly done by flashing a portable oil torch in the mouth of the block.

Experimental Bright Annealing Furnace for Brass Strip.



cently been replaced with four gas-fired furnaces. This foundry was located on the fifth floor of a manufacturing plant. Including hauling coal and ashes up and down, it is estimated the eight coal furnaces cost about 20 dollars a day to operate, exclusive of furnace labor. It is estimated that the four gas-fired furnaces will give the same number of heats per day at a cost of \$13.00 to \$14.00 on 70-cent gas.

There are a couple of minor uses recently developed in the brass industry which I believe are worth mentioning. One is the preheating of Ajax furnace linings. The Ajax furnace has a V-shaped groove in the bottom, about two feet long on each side, three inches wide, and seven-eighths of an inch thick. This lining after being rammed into shape must be thoroughly dried out and preheated. The usual method of preheating these consists of flashing a portable oil torch in the mouth of the furnace. This has the disadvantage of heating the V up to only about 1000 deg. F. Consequently when the furnace is "stuck" with molten metal at 2200 deg. F. the refractory in the V receives a severe thermal shock.

An investigation was made of various methods to heat up the V to 2000 deg. F. After experimentation a high-pressure gas burner was built for this purpose. This burner consists of an eight-foot piece of one-inch pipe with a high-pressure inspirator at the inlet end and a standard tunnel burner on the outlet. Pipe and burner are water cooled and a protrusion is welded on the burner end in which is packed a tunnel. This single burner consumes about 1500 cu. ft. of gas per hour. With this burner, temperatures approximating 2000 degrees can be obtained.

As to what material effect this will have on the life of the furnace linings remains to be seen, but it is believed that the increased life will be appreciable.

This has the disadvantage of giving spotty heating, which decreases the life of the block.

For heating this with gas either a high- or low- (preferably high-) pressure burner is used. This burner has a large gas capacity of 1000 to 2000 cu. ft. per hour depending on the size of the block to be heated and the minimum amount of time which the company wishes to allow for heating it. A heavy sheet metal or pipe cylinder extending almost the length of the block and perforated with holes is placed over the end of the burner. The holes are small and far apart at the burner end of the block and increase in size and proximity the farther away they get from the burner. With this method a very uniform heat is maintained throughout the entire length of the block.

Now for bright annealing—first, let's take the bright annealing of wire—by what is known as the strand process. I might state that the "tricks," if there are any, to bright annealing of brass or copper wire by this process have been thoroughly worked out.

There are two usual methods of reeling the wire at the outlet end—spooling and coiling. The former method, spooling, has been accomplished by a patented Surface Combustion process. The second and more common method of coiling is one of the great difficulties encountered in the strand process of annealing. However, it has been successfully accomplished.

There has been in successful operation for several months an experimental single-strand bright annealing gas-fired furnace. This furnace consists of a fire-brick box about two feet square on the end and about 14 ft. long with a pipe muffle running through the center. This pipe muffle extends out of the furnace about 15 ft. on the outlet end, and this portion is water cooled. The muffle is kept filled with Pyrofax gas, which is allowed to burn

slowly at both ends of the tube. The furnace is fired in the center with a combination of high-pressure gas burners. The wire is rapidly drawn through the furnace and emerges from the water jacket outlet end at a temperature of less than 200 deg. F.

One of the main difficulties with bright annealing by a continuous process such as this is the scratching of the material. In this furnace it was found that after running a while the Pyrofax left a fine carbon deposit in the furnace which acted as a cushion for the material being annealed. Scratching on wire is not nearly as noticeable in the final product as scratching on sheet or strip.

In using a hydrocarbon atmosphere, the atmosphere must be at a temperature of 1250 deg. F. or over to activate the hydrogen. This means that if it is desired to anneal the brass at a lower temperature than 1250 deg. F., it must be run through the furnace at such a speed that the metal itself does not go beyond the annealing temperature.

In heating this furnace, control is a very essential feature. The speed of this furnace varies to a maximum of 150 ft. per minute. Small orders for customers of this company are being annealed in this furnace and shipped out as annealed without any pickling, which is certainly a real test of the anneal and surface characteristics of the finished material. The company using this furnace is

satisfied with it to the extent that they now are giving serious consideration to a large 20-strand production unit.

The experimental furnace now being used for bright annealing strip embodies the same fundamental principles as the strand annealer already described. The relative lengths of the heating and cooling chambers of the strip furnace are approximately the same as the strand. However, the muffle of the strip furnace is wide enough to take up to seven-inch strip. The portion of the muffle which is in the heating chamber is constructed in the fashion of an "accordion" to allow for expansion and contraction.

The coils of strip when taken from the rolls are placed on a reel at the inlet of the furnace. The strip then passes through a wiper into the furnace and is recoiled on the outlet end. Pyrofax gas is used for atmosphere in the muffle, although it is expected to try other types of atmospheres, including electrolene. One of the greatest difficulties encountered in this furnace was scratching of material. This has been largely eliminated through the addition of graphite rollers.

Results obtained so far in this furnace indicate that there are future possibilities for having certain types of work pass continuously from the roll into the furnace into the next roll into the next furnace, etc., from the heavy, rough brass down to the final finished material.

Calculating Non-Ferrous Mixtures

Q.—How can I calculate mixtures that are required of non-ferrous metals, using various stock metals and alloys? For example, we have stock lots as follows:

No. 1—Commercial aluminum.

No. 2—Silicon .30 and aluminum .70.

No. 3—Nickel .20 and aluminum .80.

How can I calculate the weights of these lots to use in order to make up a mixture, such as silicon, 13; nickel, 2; aluminum, 85?

A.—One method of calculating the proportions in making up metal mixtures or alloys, such as mentioned above (including a systematic arrangement of the mathematical work so as to avoid errors, and to keep useful records) is as follows:

Composition required.—First change the percentages of the mixture to pounds, and make up equation R:

Silicon, 13 lbs. + nickel, 2 lbs. + aluminum, 85 lbs. = 100 lbs. per lot.

Equations for stock lots.—

No. 1—30 lbs. Si + 70 lbs. Al = 100 lbs.

No. 2—20 lbs. Ni + 80 lbs. Al = 100 lbs.

No. 3—100 lbs. Commercial aluminum = 100 lbs.

Then, multiply the equations for the stock lots containing the silicon and the nickel by fractional multipliers that will make the pounds of silicon and nickel in them equal to the pounds of each needed in the required mixture. Thus, to change 30 lbs. of silicon in lot No. 1 to 13 lbs. in the required mixture, multiply equation No. 1 contain-

ing the silicon by $\frac{13}{30}$ as follows:

$$(30 \text{ lbs. Si} + 70 \text{ lbs. Al} = 100 \text{ lbs.}) \times \frac{13}{30}$$

$$= (30 \times \frac{13}{30} + 70 \times \frac{13}{30} = 100 \times \frac{13}{30})$$

$$= 13 \text{ lbs. Si} + 30 \frac{1}{3} \text{ lbs. Al} = 43 \frac{1}{3} \text{ lbs.}$$

Likewise, for the equation containing the nickel, the

$$\text{multiplier is } \frac{2}{20}, \text{ giving } (20 \text{ lbs. Ni} + 80 \text{ lbs. Al} = 100$$

$$\text{lbs.}) \times \frac{2}{20}$$

$$= (20 \times \frac{2}{20} \text{ lbs. Ni} + 80 \times \frac{2}{20} \text{ lbs. Al} = 100 \times \frac{2}{20})$$

$$= 2 \text{ lbs. Ni} + 8 \text{ lbs. Al} = 10 \text{ lbs.}$$

Finally, add these two products together as follows:

$$13 \text{ lbs. Si} + 30 \frac{1}{3} \text{ lbs. Al} = 43 \frac{1}{3} \text{ lbs.}$$

$$2 \text{ lbs. Ni} + 8 \text{ lbs. Al} = 10 \text{ lbs.}$$

$$13 \text{ lbs. Si} + 2 \text{ lbs. Ni} + 38 \frac{1}{3} \text{ lbs. Al} = 53 \frac{1}{3} \text{ lbs.}$$

From the sum we find that we have the 13 lbs. of Si and 2 lbs. of Ni required in the mixture, but the total is 53 $\frac{1}{3}$ lbs. instead of 100 lbs. required in the batch. Therefore, we must add enough aluminum to make up the 100 lbs., which is done as follows:

$$13 \text{ lbs. Si} + 2 \text{ lbs. Ni} + 38 \frac{1}{3} \text{ lbs. Al} = 53 \frac{1}{3} \text{ lbs.}$$

$$0 \quad 0 \quad + 46 \frac{2}{3} \text{ lbs. Al} = 46 \frac{2}{3} \text{ lbs.}$$

$$13 \text{ lbs. Si} + 2 \text{ lbs. Ni} + 85 \text{ lbs. Al} = 100 \text{ lbs.}$$

It will be noted that when 46 $\frac{2}{3}$ lbs. of aluminum are added to 53 $\frac{1}{3}$ lbs. in order to make up the 100 lbs. in the batch, the same weight must be added to the left-hand side of the equation so as to balance, thus making a total of 85 lbs. of aluminum in the bath. This is the 85% required.

W. B. F.

Brass Casting

By F. A. W. LIVERMORE

Consulting Foundry Engineer, Birmingham, England

A Few of the Broad, Practical Principles of Casting Brass in Sand

NO doubt, readers of any metallurgical journal know that there is no problem in metal technology which appears on the face so simple, and which is, in reality, often so difficult as the production of sound castings. We know it takes an experienced hand, and one well acquainted with the tricks of the trade to assist him in dealing with the subject, and this plea may serve as an excuse for entering at some length into a somewhat threadbare topic.

Very considerable improvements have been made in brass casting of recent years, perhaps mainly due to the leading consideration of the Great War—output—when technology and all its branches had to be made use of in the great effort.

Temperature is undoubtedly one of the most important of the various factors which influence the quality of castings. The measurement of temperature of molten metal should receive as much attention as the measurement of temperature of annealing furnaces. Comparatively few foundries have a pyrometric installation and those who do often lay very little importance on the data that may be obtained from its readings. In an article to the British "Metal Industry," by J. Arnott on this question he states that a pyrometer which will be of real service to the brass foundry should have the following characteristics:

(a) It should be accurate within 1%, this means a maximum error of 10 degrees at 1000 degrees C.

(b) It should be capable of use up to 1300° C. if required.

(c) It should indicate the temperature of molten brass within at most, one minute of immersion.

(d) It should show a direct reading and involve no calculations whatever.

(e) It should be strong and not easily put out of order; and should permit of easy and cheap repair.

(f) It should not be too expensive.

He recommends a base metal thermo-couple protected by a nichrome steel sheath which is connected to a galvanometer by compensated wire leads. In my experience, I find this method is by far more reliable, practical and cheaper than optical, radiation or resistance types.

We know that brass castings are subject to various defects which are difficult to discover by surface inspection, or even by hydrostatic testing when such a test is practicable. The defect which most commonly occurs results from the inclusion of oxide of the metal in the casting. This oxide formed during the melting by the action of oxygen and other gases from the air and furnace, is absorbed by the molten metal and greatly reduces the elongation and density. If a tensile test is impracticable, oxidation of the metal can be discovered generally by the bending test when a number of small cracks open on the outside of the bend, if the oxidation is extreme; also by the abnormal color of the surface of the fracture. Since foundry sand is a poor conductor of heat, metal which has been taken to a high temperature will retain the heat concentrated in the liquid metal. Now the metallic oxides contained by the metal will be decomposed by the heat

and the result is that gases are created which cannot escape, as by that time the outer surface of the casting has solidified. There is therefore no means of escape and these gases form blow holes and honey combing in the interior of the casting, thus materially impairing its physical and machining properties.

The utilization of scrap (by itself) is not recommended since it encourages the gas absorption and formation of oxides, and in addition to this the metal becomes thick and is inclined to be brittle. The presence of included dross is not easy to discover. If a hydrostatic test cannot be made, it is practically impossible to find out such defects unless they happen to be near to the surface of the casting. The best way to ensure freedom from this kind of defect is correct molding. The designer and foundryman should work hand in hand; every brass or bronze casting should be designed with reference to a given position in the mold. The position being determined, the various portions of the casting should be so arranged that they are connected by a rising channel of increasing cross section and with a minimum of effects with one of the risers, which of course, should be of much greater diameter than the thickest part of the casting. The reason for this is clear, since after shrinkage, cavities would otherwise form in the heavier parts of the casting. (These parts can often be chilled.)

Whenever possible castings should be poured from the bottom; that is, the pouring gate enters the molds at the lowest point, and so much dross is prevented from lodging in the mold but flows up into the risers.

Insufficient riser capacity presents another source of trouble. Whenever dross is likely to collect in a casting a riser should be placed. Often expensive castings are scrapped because the foundryman, prejudiced by consideration of economy is in favor of few and small risers.

The question now arises, what is the best way of eradicating these defects, namely blow holes and honey combing or the occlusion of oxides and gases in the molten metal? A deoxidizer is generally added, that is, a reducing agent which totally destroys all gases and oxides contained in the liquid metal, forming a scum which floats on the surface of the metal and can be easily removed before pouring. Carbon, phosphorus, magnesium, etc., will readily reduce oxides. Magnesium is not only a good agent but also improves the strength and toughness of the casting. Brass castings fluxed with magnesium show a homogeneous closely-grained structure, and as regards physical properties, about 6 per cent increase in elongation and an increase in strength of 6 to 8 kilos per sq. mm. Sulphur, iron, arsenic and antimony are deleterious to the properties of the casting. Potassium cyanide, nitre and soda are de-sulphurizers; volatile impurities like arsenic, antimony and tin evaporate off at high temperature; nitre will generally remove most of the iron as a dross.

I should like to add that overheating produces an interior oxidation, probably by opening fissures between the grains; the strength of the material is greatly lessened and the ductility reduced almost to zero.

Huge Aluminum Casting

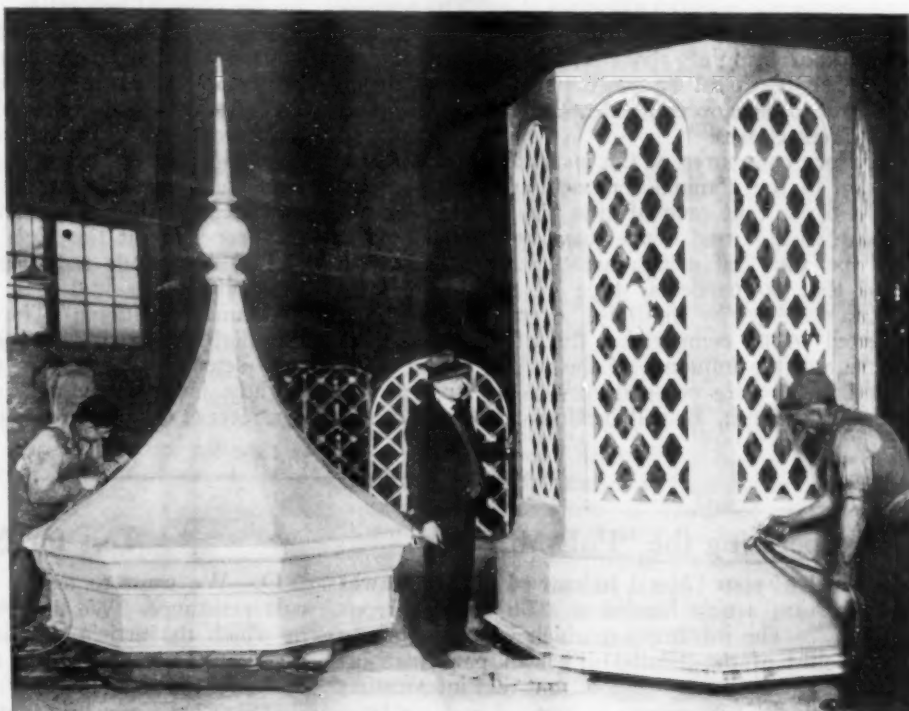
WHAT is believed to be the biggest solid aluminum casting ever produced was recently made by the Werra Aluminum Foundry Company of Waukesha, Wis. The tower, weighing approximately 3,000 pounds is to be placed atop the Steuben Junior High School in Milwaukee.

The casting was made from a mold 12 feet high and eight by eight at the base, with 65,000 pounds of sand

The company has orders for a carload and a half of spandrels for the new Seattle (Wash.) federal building and is also furnishing spandrels for a new high school in Rochester, N. Y. The company's work is also going into the new post office in Jacksonville, Fla.

On May 17, Mr. Werra celebrated 49 years in the foundry business. Approximately 50 people are employed by the foundry at the present time as against 700

Aluminum
Casting of
Extraordinary
Size Made by
the Werra
Aluminum Foundry
Company,
Waukesha, Wis.



inside. The pattern for the tower was made by the Kohver Pattern Company of Milwaukee. The cupola was cast in three pieces, the base, the head and mullions with its fancy grille work. The aluminum tower weighs approximately three times less than would a similar one constructed of steel. It is one piece, not welded.

Conrad Werra, president of the company, is one of the pioneers in aluminum development. When 13 years old, Mr. Werra started as an apprentice in the famous Krupp steel works in Germany. He came to this country when 20 and worked in Beloit, the E. P. Allis Company in Milwaukee, and in Manitowoc, Wis.

Mr. Werra moved to Manitowoc in 1900, and started a foundry devoted to aluminum. In 1910 he sold the plant to the Aluminum Castings Company of Cleveland, Ohio. Then, in 1913, he went back into business and set up his aluminum foundry at Waukesha. This is now one of the largest plants of its kind in the country.

Another unusual job completed by the Werra concern was in connection with the grille work for the Milwaukee county courthouse. The specifications said they must be of uniform length, 17 feet 3 inches and 2 feet 6 inches wide and cast hollow. The problem of meeting the exact measurements of more than 1,000 grilles, despite the fact that when molten aluminum is poured into the mold there is shrinkage in the cooling, was the problem faced by the Werra foundry. However, the grilles are in the building and the Waukesha concern lost only four grilles in casting.

several years ago. But the company sees something of the old days back as aluminum is more generally used and right now is going into buildings at a smart pace.

Effect of Cold Working Monel Metal

By N. B. PILLING*

The notched bar Izod value of monel metal is first increased and then decreased by cold working. The maximum occurs at about 10 per cent reduction by cold work, corresponding to a Brinell hardness in the range 155 to 175. Stress relief annealing increases both hardness and impact value. Impact properties of drawn rods are sensibly uniform and do not depend upon relative direction of bending.

Impact properties of rolled flats are highly directional and depend upon the position of the notch with respect to the axes of rolling. Impact value is greatest when the notch lies parallel to the breadth dimension of the flat.

The correlation between hardness and Izod value is good only when working is followed by a low-temperature anneal. Under these circumstances the Izod value is closely related to the apparent Brinell hardness of the fiber parallel to the bottom of the notch.

*A paper presented at the 1932 Annual Meeting of the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.

Factors Affecting the Physical Properties of Cast Red Brass

IN 1929, when the special committee of the American Society for Testing Materials on promotion of general use of specifications for copper alloys in ingot form made a survey of the industrial field, it was found that 600 copper-base alloy compositions were then in use that might be grouped into 20 classes. Simplification in industry inspired the hope that eventually each class might be represented by one composition.

The Non-Ferrous Ingot Metal Institute agreed to sponsor an investigation at the United States Bureau of Standards under the research associate plan. The purpose of the investigation was to obtain data upon which to base further work of bringing about agreement upon an optimum number of typical compositions of copper-base ingot metal and to develop equitable standard specifications for the different classes.

The advisory committee of the institute suggested that as red brass of the nominal composition of 85 per cent copper and 5 per cent each of zinc, tin, and lead is one of the most widely used copper-base commercial alloys it should be the first alloy investigated. As it was recognized that no particular type of test bar is now accepted as standard by industry, several distinct types were selected to be compared. The effect of pouring temperature and the influence of the use of virgin metal or remelted metal were other factors to be studied.

The tensile strength, Brinell hardness, electrical resis-

tivity, and density were determined for various types of test bars cast at temperatures ranging from 1,900° to 2,300° F. The maximum values were obtained for the test bars cut from the chill ingot, and pouring temperature had little influence on these results. Somewhat lower values were obtained for the test bar obtained by the immersion in the molten metal of a graphite shell. Lower values were obtained for the sand-cast test bars. For the latter it was found that a pouring temperature above 2,200° F. had a pronounced influence on the physical properties.

A study of the metallographic structure of the test bars poured at high temperatures indicated that the marked columnar structure formed under such conditions is accompanied by inferior physical properties.

Microscopic examination of the same bars showed markings due to strain or deformation in the sand-cast bars that were absent in the bar from the immersion crucible. To this was attributed the difference in physical properties at the high temperatures.

The alloy made from remelted metal was found to be somewhat more fluid than from virgin metal cast under the same conditions. The shrinkage of the alloy from the highest pouring temperature to room temperature was determined. It was noted that the alloy expands slightly immediately after solidification, after which it contracts at a uniform rate to room temperature.

Operating the "Pull Mill"

Q. In No. 1 of your "Metal Industry 1932" there was a very interesting article headed as "The Non-Ferrous Rolling Mills." The information which you have briefly given on account of the "Pull-Mill" is of particular interest for us. It is necessary to point out that information about such mills is very scanty in general and we have no complete details about them.

In the name of our Leningrad Metallurgical Institute in which I have a professor's chair, I beg to apply to you with a request of forwarding us possibly more detailed information about the "Pull-Mill" machinery or in any case to let us know from whom it might be obtained.

Particularly we should like to find out the following:

1. What thickness is the ribbon in the beginning which is used for these mills?
2. To what extent may be limited the pull of a ribbon in one pass considering the possibility of its rupture in the pulling end?
3. How much less is the loss of energy comparatively to the usual "4-High Mill"?

A.—1. Metal of any thickness which is readily threaded into the mill. For example 0.187" (3/16") is reduced to .005; .080 to .002; 18 and 8 chrome nickel stainless from .240 to .018. All of this rolling is done without any intermediate annealing, and without removing the strip from the mill.

2. The limit of the amount of the pull depends on the elastic limit of the strip in the mill. Good practice is not to reduce the thickness more than 25 per cent per pass.

3. Comparing the Roller Bearing Pull Mill with the 4-High Roller Bearing Mill, the power consumed is practically the same, any difference being slightly in favor of the Pull Mill.

W. J. PETTIS.

Test for Nickel Plate

Q.—We want to test a nickel plated steel article for rust resistance. We understand that there is a chemical in which the article can be immersed that will quickly give you a test that can be transposed to a salt spray test by use of a chart.

If you have any information about this method or any other quick method of testing nickel plated steel for rust resistance, we will appreciate your sending same to us.

A.—We believe it probable that the quick test of the porosity of nickel plating mentioned refers to the ferricyanide or "ferroxyl" test. This will be found described on page 76 of the inclosed preprint, "The Protective Value of Nickel Plating" and a correlation with the salt spray test on page 525 of the inclosed preprint "The Protective Value of Nickel Plating," 11, Supplemental Observations (Bureau of Standards).

References should be made to a recent discussion of the subject on page 124, Value of Nickel Plating and on page 131, Permeability, in the textbook by Blum and Hogaboom, Principles of Electroplating and Electroforming, 2nd edition, 1930.

It should be pointed out that since the publication of the inclosed papers, improvements have been introduced into nickel plating and much of the latter is now flashed with chromium. These data may, therefore, now need modification. We do not recall any recent chart correlation between ferricyanide and salt spray. The Bureau of Standards is at present re-investigating the whole subject, but it may require a year or more to complete this new work.

For the benefit of those who did not desire to make up the ferricyanide agar jelly, there was brought out a few years ago by Karl Pitschner, a test paper which could be moistened and laid on the sample of plating. We believe that this is still supplied under the name of "Ferraco" paper by the Fisher Scientific Company, Pittsburgh, Pa.

Powdered Metals By Electrolytic Methods

By Dr. JOSEPH ROSSMAN

Washington, D. C.

An Extended Review of the Patents Covering This Method of Manufacturing a Material Which Has Aroused Great Interest and Seems to Have a Wide Field.

THE structure of metals obtained by electrolysis depends upon many conditions such as the composition of the bath, the concentration, temperature, motion of the electrolyte, current density, etc. By regulation of these conditions it is possible to obtain any desired character of metallic deposit from a bright dense compact plating to a loose crystalline powder.¹

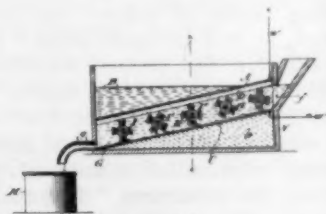
Electrolytic methods thus offer a very convenient and economical method of preparing metallic powders in a small or large quantity as desired. There is very little literature available on this subject. The following abstracts contain information on electrolytic methods of making metallic powders from aqueous electrolytes as given in the patent literature.

United States Patents

1. 521,991, Sachs and Huber. June 26, 1894. (British 12,381 and 12,382 of 1894. German 79,896 and 79,897.)

This patent describes a process for plating powdered metals. Zinc powder, for instance, may be plated with brass. The plating is carried out by a special apparatus. As shown in the illustration, a receptacle made of any suitable material is provided with an inlet aperture *f* and an outlet aperture *g*. The cathode *C* made of a sheet of brass in the form of a flat plate, is secured in the box in an inclined position from the inlet to the outlet aperture and rests upon a solid base *b* of cement. The anode *A* made of a suitable material is also secured within the box *V* in a position parallel with that of the cathode *C* and it is separated from the anode by a diaphragm *D* of baked clay. (See Fig. 1.) It is necessary that the anode should

Fig. 1.
Equipment
for Plating
Powdered
Metals.



be perforated or made otherwise permeable. Electric wires *W, W'* are connected with the anode and cathode in the usual manner and supply a current from a source of electricity not shown. Mounted on shafts *E* journaled in the side of the box *V* in any suitable manner, and located

between the anode and cathode, is a series of brushes *I I' I''*, etc., adapted to revolve, across the surface of the cathode and actuated by any suitable means. The brushes should be so arranged that their extremities just touch the upper surface of the cathode.

The action of the apparatus is as follows: Surrounding the anode is a bath *B* consisting of a cyanide solution, containing copper and zinc salts. There is then caused to be fed at the inlet aperture *f*, by any suitable means, a cyanide solution of copper and zinc salts in which is powdered zinc *G*, or other similar metallic conductor in a finely divided state, and which has been previously well cleansed. The brushes *I I' I''*, etc., are then set in rapid motion. The particles of powdered zinc are caught by the bristles and forced over the cathode. They are thus prevented from adhering to the cathode or to each other. It will be found that in a short time each particle of the powdered zinc has been completely covered with a shell of brass deposited thereon. The covered particles gradually drop downward by the action of gravity and the freedom of motion caused by the agitation of the solution by the brushes, until they reach the outlet aperture and are received in a suitable vessel, as *H*. The length of the cathode and strength of the current should be so arranged that each particle of the zinc will be completely covered by the time this outlet aperture is reached. This data should in each case be predetermined by experiment.

The product obtained by means of the process described when removed from the bath and dried is, so far as its external appearance goes, pure brass, and, if a powder of this kind is desired, it is ready for use after polishing. If, however, other shades of color are desired or surfaces of other metal are to be used, such product may be treated as follows: It may be treated electrically or by simple immersion and its particles receive a direct deposit of other metals or alloys, for instance, nickel, silver, gold, iron, copper, brass, lead, etc., and various shades of color and different metallic lusters may be produced by treating the metals so deposited in ways well known in the art, for instance, by using solutions composed of salts of different metals, by changing the anodes, or by treating the coated particles with different or varying degrees of heat. In short, this product may be treated as though its particles were pure brass. During any such subsequent processes, however, the grains must be kept from adhering to each other by continual agitation.

Other metallic bases for the powders may be employed, instead of zinc, for instance, iron, copper or other alloys or metals may be deposited thereon, but the principle upon which the formation of the product depends will be the same in each instance.

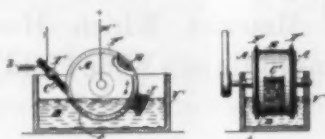
¹For a good discussion of these factors see Chapter 7, pp. 85-119 of Blum and Hogaboom "Principles of Electroplating and Electroforming," McGraw-Hill, 1930.

2. 522,415, Huber and Sachs. July 3, 1894.

Metallic powders are made by using the same apparatus as described in patent No. 521,991. Instead of mixing powdered zinc or other metal with the electrolyte, powdered graphite is used. Each particle of graphite will be covered with a shell of metal.

Another method of making metal powders is carried out by an apparatus consisting of a lead lined tank. Suitably mounted within this tank is a grindstone R of quartzite, emery, or other similar material, not affected by the bath and adapted to revolve. (See Fig. 2.) This grindstone is immersed in the copper solution B and on

Fig. 2.
Lead-Lined
Tank
Used for
Making Metal
Powders.



each side of it is secured an anode plate A insulated by a plate F of hard rubber. A rod of carbon C' mounted in a holder T automatically fed against the grindstone R by a spring z, serves as the cathode. Both the anode and cathode are supplied with current by means of the wires w w'. At the bottom of the vessel V is a brush J adapted to press against the surface of the grindstone R. The operation of this form of apparatus is readily understood. The grindstone removes particles of the carbon from the plate C'. These particles form a conducting ribbon c on the surface of the stone R and as they pass through the bath B receive a deposit or shell of copper and are brushed off by means of the brush J.

Other non-metallic bases for powders may be employed instead of carbon and other metals than copper may be deposited thereon, but the principle upon which the formation of the product depends will be the same in each instance.

3. 585,359, Hoepfner. June 29, 1897. (British 17,671 of 1896. German 87,430 and 89,289.)

This patent describes the preparation of storage battery plates by depositing alternate layers of compact and spongy lead. It contains a discussion of the conditions under which spongy metal deposits are obtained such as by controlling current density, bath concentration and temperature.

4. 598,313, Clark. Feb 1, 1898.

The process of producing finely-divided lead of a feathery and fibrous nature consists in first dissolving acetate of lead in water, then immersing in this solution a plate of zinc and allowing it to remain until a portion of the lead has been deposited and a portion of the zinc substituted therefor in the solution; then passing a current of electricity through the solution from a lead anode to a cathode until the deposit of lead on the cathode changes from a frothy appearance to a feathery appearance and then continuing the electrodeposition of the lead upon the cathode horizontally arranged in the lower portion of the solution.

5. 821,626, Edison, May 29, 1906.

Small flakes of cobalt or nickel for use in storage batteries are prepared by first depositing on a plate of polished copper a thin film of zinc by immersing in a zinc sulfate solution. Cobalt or nickel is electrodeposited on this plate which is then immersed in a weak acid solution. The acid attacks the zinc and the film of cobalt or nickel is detached in small flakes.

6. 865,688, Edison. Sept., 10, 1907.

The process of making flakes of cobalt or nickel consists in depositing on a suitable cathode alternating layers of copper and cobalt or nickel, or both, cutting the composite strip into long strips, subjecting them to a solution of 30-40% KCN to dissolve the copper, drying the resulting strips and finally reducing them to pieces of the desired size.

7. 923,411, Coles. June 1, 1909.

Zinc dust is obtained by depositing it upon a revolving disc in the form of a sponge and scraping it off. The electrolyte consists of caustic soda solution and anodes of an alloy of zinc and iron are used. The zinc dust is dried in a reducing atmosphere.

8. 936,525, Edison. Oct. 12, 1909. (French 367,863).

Cobalt, nickel or cobalt-nickel alloy flakes are made as follows: The cathode consists of a cylinder of nickel-plated polished copper which is rotated during the plating and subsequent operations. The cathode is first rubbed with graphite so as to polish the surface and permit the effective separation of the deposited composite sheet. The cathode is placed in a copper sulfate bath. Copper anodes are used and a thin film of copper is deposited. The cathode is now washed and immersed in a cobalt or nickel or cobalt-nickel bath, the solution used being an ammonium sulfate solution of the metal or metals to be plated, and anodes of cobalt or of nickel or of cobalt and nickel being employed. In the latter case, the anodes and the depositing current will be so regulated as to secure the desired relative deposit of the two metals. When the cobalt or nickel, or cobalt-nickel has been thus deposited on the copper film, the cathode is again washed, returned to the copper bath and a second layer of copper is deposited on the cobalt or nickel or cobalt-nickel film. After washing, a second film of cobalt or nickel or cobalt-nickel is deposited on the second copper film and these operations are continued until a sufficient number of layers of copper and cobalt or nickel or cobalt-nickel are secured. The composite sheet thus obtained on the cathode is easily stripped by cutting the sheet longitudinally, so as to permit the sheet to be peeled off. To facilitate this cutting of the composite sheet, the cathode is formed with one or more longitudinal grooves which act as effective guides for the cutter. After the sheet has been thus separated from the cathode, it is cut up into strips about three inches wide, and these strips are subdivided by means of a suitable cutting machine, into squares or other forms, the dimensions of which in length and breadth determine the ultimate size of the flakes to be produced. Ordinarily, each flake will be about 1/16 of an inch square. At this stage of the method are obtained a great number of very small squares each formed of successive and alternating layers of copper and cobalt or nickel or cobalt-nickel, as will be understood. It now becomes necessary to dissolve the copper without affecting the cobalt or nickel or cobalt-nickel flakes, thereby eliminating the copper and separating the flakes desired. This is effected by soaking the sub-divided composite bodies in a very strong solution of cyanid of potassium, and agitating during the treatment. The cyanid dissolves the metallic copper, without appreciably affecting the cobalt or nickel or cobalt-nickel, thus freeing the flakes of cobalt or nickel or cobalt-nickel and effectively separating them. These flakes may now be used directly in the make-up of the battery electrodes or they may be first annealed in hydrogen before such use.

This article will be continued in an early issue.—Ed.

Electro-Tin Plating

By R. E. MAEDER

Frigidaire Corporation, Dayton, Ohio

How Electric Refrigerators Are Tin Plated Inside to Protect Them from Corrosion. Practice of the Frigidaire Corporation

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, JULY, 1932

IN THE manufacture of electric refrigerators a large amount of copper and brass is used. Much of the copper and brass is used inside the refrigerator in more or less intimate contact with food. The atmosphere on the inside of a refrigerator is quite corrosive to most metals. It is necessary to coat most metals with something to protect them from this corrosion. However, it is desirable for several reasons that the coating be metallic in character.

Back in the fall of 1925, Frigidaire had an assembly which they were coating with pure tin. They were tinning in the time-honored fashion of dipping the various parts in molten tin and wiping off the excess with a rag or a sheepskin. These parts were then soldered together with pure tin solder. This gave a fairly satisfactory job, but the process was difficult and expensive. It was thought that if the assembly could be electroplated a large saving in labor and tin could be effected.

In giving consideration to various electroplated metals, only four offered any possibilities. These were tin, cadmium, nickel and chromium. Tin was the logical metal to use. Cadmium did not offer the desired protection. Nickel and chromium both lack the necessary throwing power.

In going over the literature on electro-tin plating at that time, we found that the known tin baths were of two kinds, namely: the acid bath and the alkaline bath. Both of these types of baths offered objections that made them impractical for use on work such as occurs in the building of electric refrigerators.

The acid bath, as was demonstrated in a short time, did not have the throwing power necessary for plating the above mentioned assembly. Then, too, the character of the deposit made it impractical for obtaining the required heavy deposits due to its tendency to tree.

The existing alkaline baths that were investigated at that time were entirely too unstable. In order to obtain a uniformly thick deposit on work as large as an evaporator it is necessary to have a stable solution.

Late in the year 1925 we found that the Roessler & Hasslacher Chemical Company* were offering a tin compound which they recommended for use in electro-tin plating. We ordered some of this material, dumped the current solution from our experimental tank, and made up a sodium stannate solution according to the formula submitted by them. I do not remember this formula, but we got the first real encouragement from using a solution with sodium stannate as the tin compound. How-

ever, as we used this solution experimentally, various troubles were encountered. After a few runs the solution began to decrease in both throwing power and efficiency.

We decided that the alkalinity of the solution increased with use, due probably to low anode efficiency. This decrease in efficiency was contributed to by the following conditions:

First, poor anode contacts. As the dried sodium stannate is a good insulator for low voltages, care is necessary in keeping anode bars and hooks clean.

Second, too high anode current density causes the anodes to become passive.

Third, which amounts to the same thing, insufficient anode surface.

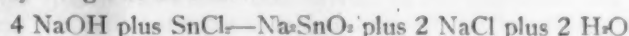
We tried by various methods to reduce this free alkalinity, using tin oxide muriate of tin, hydrochloric acid, acetic acid, etc. We came to the conclusion that muriate of tin offered the best means for our purpose of controlling the alkalinity of the solution. By this time we had evolved a theory (which I am not going to attempt to prove) explaining what happens when a sodium stannate solution is electrolyzed.

The theory is that a solution of sodium stannate which contains approximately two pounds per gallon, hydrolyzes to the proper hydroxyl ion content, thereby obtaining maximum throwing power and at the same time giving nearly 100% anode corrosion. It seems probable that a small amount of stannous tin is present as sodium stannite, which in my opinion has an effect on the throwing power of the solution. Very small additions of stannous tin increase the throwing power of the solution. Too much of it causes a pulverent deposit.

An increase in the sodium hydroxide content above the optimum amount causes a decrease in throwing power. If these assumptions are correct, the addition of muriate of tin should accomplish two things. First, it reduces the free sodium hydroxide content and second, it increases the amount of sodium stannite.

While we have never determined the stannous tin content of our tin plating solution, we have attempted to measure the hydroxyl ion concentration by means of the Hellige color standards. The fact that the hydroxyl ion concentration is always 11.6 pH for a solution in good working condition leads us to believe that the sodium hydroxide content is buffed at pH 11.6 by the sodium stannate.

A simple reaction showing the effect of muriate of tin may be given as follows:



*See "An Efficient Electro-Tinning Process," by F. F. Oplinger, METAL INDUSTRY, December, 1931, pages 529-532.

Solution Composition

Sodium Stannate	32 oz. per gallon
Muriate of Tin	1/32 oz per gallon

A wide variation in the sodium stannate concentration is permissible. However, we keep our solution at this concentration as it makes a good stable solution which is easy to control. The only objection to the high concentration is the initial cost and the loss through dragout, for this solution does not rinse freely.

Operating Conditions.

Anodes should be pure tin.

Ratio of anode to cathode surface: Minimum $1\frac{1}{2}$ to 1 or the anode surface should be such that the anode current density is not greater than 15 amps. per sq. ft.

Cathode current density: 15 to 45 amps. sq. ft.

The solution temperature should be 110°-130° F.

The 130° F. maximum is the temperature at which insoluble tin oxides begin to precipitate in excessive amounts.

Voltage: 4 to 8 volts.

Control of the Solution

The control of the sodium stannate solution is very simple as operated in our plant. The tin content is kept up by addition of a concentrated solution of sodium stannate. This solution is made up in a separate tank by using heat and air agitation and can be carried at about 4 lbs. per gallon. It is then allowed to settle and only the clear solution is added to the plating tank.

Muriate of tin is added in small amounts as necessary. The skill of the operator is largely relied upon to determine this in order to avoid diminishing throwing power. However, if the anode current density is at or below 15 amps. per sq. ft., it is possible to operate for months without adding muriate of tin. To do this it may be necessary for the operator to vary the current density.

It is obvious that the less muriate of tin used the better. For one thing, the solution builds up in sodium chloride with the continued use of muriate of tin. While a small amount of chlorine in the solution is probably beneficial from the standpoint of anode corrosion, large amounts of salt in the solution can only be detrimental.

The operator controls the current density largely by the appearance of the anodes. The anodes will have a peculiar greenish-yellow color during electrolysis when the solution is working properly. The operator endeavors to keep the current density as high as possible without losing this color. As soon as a slight brownish color appears on the side of the anode toward the work he lowers the current density a little.

Application

There are 45,000 gal. of tin plating solution in our plant.

We electro-tin evaporators, both for household refrigerators and for large commercial installations.

Many thousands of feet of copper tubing are plated each year. This tubing is plated in 20 to 60-foot lengths, in coils about two feet in diameter.

At one time our ice tray was electro-tinned and given a semi-lustre by scratch brushing. The solution works well in barrel plating. Many small parts are plated for appearance and for corrosion resistance.

Corrosion Tests

For the reason that we know of nothing better we have at times used the salt spray test for an accelerated corrosion test of electro-tin plated copper. Our evaporator coils with a plating time of 25 minutes withstood the salt spray 400 to 600 hours before showing copper.

The ice tray which was plated 30 minutes and scratch brushed was required to withstand 1,000 hours salt spray without showing copper.

Copper Refinery for Great Britain

A company has been recently formed in England under the title of British Copper Refiners, Ltd., with the object of producing high conductivity copper for electrical purposes. The new company is closely associated with British Insulated Cables, Ltd., Prescott, Lancashire, which will supply consumers of copper and copper products with metal refined in England and produced by British labor and capital. This new refinery will be the first and only works of its kind in Great Britain.

The raw material to be delivered to the new works will be in the form of blister copper, and the finished products will embrace copper billets, bars, cakes and slabs of exceptional purity, these forming in turn the raw material for the manufacture of overhead and underground cables, winding wires and other conductors for electrical purposes, as well as for high-class copper plates, sheets, tubes, sections and other mechanical requirements.

The refinery will be at Prescott, where ample transport facilities are available; and the very latest type of plant and equipment (based on international experience) will be employed. The initial maximum output of the plant at present to be installed will be 1,000 tons per week, but provision is being made whereby extensions of buildings and machinery can be carried out. Work has already been commenced on the site, and it is expected that the new

refinery will be in production towards the end of the year. The raw material will be imported from the Roan Antelope Company's mines in Rhodesia, Africa.—A. EYLES.

Bellows Metal

Q. We are inclosing blue print of metallic bellows. The wall of this bellows is to be three-ply, each ply approximately .010" thick, the total wall thickness, therefore, being approximately .030".

Will you kindly advise us.

1. The best alloy from which the bellows should be made. The largest of the three tubes is to be $1\frac{1}{8}$ " O. D., all tubes to be metal to metal fit one over the other. By metal to metal fit we mean the smallest possible clearance that will permit telescoping. Each tube to have a wall thickness of .010";

2. Would you recommend that the bellows be made by the rolling process or by the hydraulic process?

A.—The character of the non-ferrous alloy used would be governed by the number of compressions, (per minute) the bellows are subjected to and the temperature conditions under which bellows are used. Any of the brass manufacturing firms advertising in METAL INDUSTRY will be able to submit a bid with recommendations about the material to be used.

W. J. P.

The Polishing of Stainless Metals

By W. C. BREITING, E. F. BROWN, E. F. GLEASON and R. S. SCHWAEGERLE

Grain Demonstrators for the Norton Company, Worcester, Mass.

The Following Article Contains the Recommendations of Norton Grain Demonstrators as Based Upon Actual Experience in Factories Throughout the Industry.

FROM "GRITS AND GRINDS," FEBRUARY, 1932

THE wider use of the new non-corrosive metal alloys, known as stainless steels and stainless irons, because of their ornamental as well as utilitarian characteristics, has led to extensive and somewhat confusing discussion of the polishing of these metals. Stainless steel polishing is not as complex as at first thought. There are two main factors which decidedly influence the retention of the lustre on any finished piece of stainless steel or iron, whether it be made from sheet stock or casting. These two factors are freedom of the finished surface from minute foreign particles, particularly finely divided iron, and the complete removal of all slag spots, scratches, pit holes or even tiny imperfections.

The possibility of impurities or foreign particles being left on the surface may be minimized by the use in all polishing and buffing operations of manufactured aluminous abrasive such as Alundum abrasive, that is, substantially free from iron. Proper selection and sequence of grain sizes; the crossing of scratches in each succeeding polishing operation and the addition of operations where crossing of scratches is impossible will minimize the probability of scratches or other imperfections being left on the finished surface.

With these two factors in mind little difficulty should be encountered in the polishing of the stainless steels and irons. Other difficulties encountered when these metals were first produced have been overcome by improvement in the product itself and by knowledge gained in its polishing.

Generally speaking, the principal difference in the grinding or polishing action on stainless steel or iron in comparison with other steel alloys is that stainless metals are a little tougher, a little more stringy. They show a tendency to drag and because of this action wheel life is shorter than it is on some of the other steel alloys.

Other than compensating for the above-mentioned difference, the polishing of stainless steel is done much as is the polishing of any alloy, although operators must be more careful with stainless steel than with carbon steel. Care must be exercised to prevent excessive heating; wheel speeds must be controlled, pressure must be controlled; the proper amount and type of lubricants used; care employed in the selection of buffs and the proper selection of abrasive grain sizes.

Wheel speeds in polishing should range between 6500 and 7500 s.f.p.m. In buffing, the speed should be between 10,000 and 12,000 s.f.p.m., and in every operation it is very important that the wheel be in balance. Tallow or

some other lubricant should be used to prevent overheating and discoloration on all operations except the first, and the final coloring. In cutting down operations the operator should avoid forcing the wheel as this often causes discoloration which is difficult to remove in later operations.

In the roughing operations as fine a grain size as possible should be used in order to prevent deep scratches which later may require extra operations to remove. Finer sizes may be used for the first operations on sheet stock than on castings because of the differences in the condition of the metal when it comes from the mill and foundry.

Having selected the proper size and sequence of grain the crossing of scratches will materially aid in attaining the desired finish. When succeeding scratches follow in the same direction, there is a tendency for the abrasive to cut deeper, necessitating further operations and waste of material to remove these cuts. Crossing of the marks also enables the operator to determine definitely whether or not the scratches of the previous operation have been removed. In some cases where automatic machinery prevents the crossing of scratches extra operations will be necessary to obtain an equivalent finish.

Polishing Sheets

Several types of machines are used in polishing stainless steel sheets. On some an endless belt made of canvas 50 inches wide and approximately 20 feet in circumference coated with abrasive is used. The belt is driven by two pulleys, one of wood and the other of sewed buffs, to give a cushion for the belt and take care of any irregularities in the sheet. This cushion pulley is very essential as a hard pulley would cause the belt to burn the sheet.

A roll 50 inches wide made from sections of sewed buffs 20 inches in diameter and pressed on a steel shaft 6 inches in diameter and coated with abrasive is another type of machine. Both of these machines operate in the same manner as a planer; that is, the sheet is held on a table which moves back and forth under the belt or roll.

Another type of machine now being developed can operate either a belt or a roll and is so constructed that several units can be attached together, the sheets passing under each roll, making it possible to rough a sheet in one pass through the machine. It has a clamping device which holds two sheets at the end making it a continuous machine. The belts used on this machine are 7 feet in circumference.

Method of Coating Belts and Rolls

Two methods are used in coating belts and rolls. Where fine grain sizes are used the general practice is to thin the glue to the proper consistency for the size of the abrasive to be used, then add the abrasive until the mixture is of the right consistency for spreading. It is very important to stir the mixture thoroughly before application. The abrasive, being so much denser than the glue solution, settles to the bottom very rapidly and unless held in suspension by stirring, it will be almost impossible to get a uniform structure on the coated belt. Two coats of abrasive are generally used on the belts. In coating the rolls as many coats are required as are needed to build up a head approximately $\frac{1}{4}$ inch thick.

When coarse grain is used the paste process is impractical because of the difficulty in spreading the mixture of glue solution and grain. Limitation of grain size which can be used in paste form is dependent upon the experience and skill of the set-up man and the requirements in each instance. In some cases, a paddle rather than a brush is used for spreading, but even this procedure may result in an extremely hard coating which tends to burn the metal.

The more practical method of coating belts with coarse size grain is to apply the glue solution to small portions of the belt or roll at a time and spread the abrasive onto the glue by sifting. The grains are readily bonded by the glue and a more uniform head results.

After being coated and allowed five or six days to dry out, these rolls will be out of truth. This error is corrected by turning them in an engine lathe using a Crystolon abrasive brick in the tool post. The use of oil on the brick will prevent it from glazing the surface of the roll. A slow speed should be used at first when turning a roll into truth, but it should be finally trued at running speed.

Abrasive Used

The grade of the rolled finish which varies in different mills will determine the size of abrasive to be used on the first or roughing operation. Where Alundum abrasive is used a range from No. 60 to No. 80 is giving very satisfactory results. For the second operation, which depends upon whether or not No. 60 is used to rough grind, the roughing marks can be removed by using from No. 90 to No. 120 and for the final finish from No. 180 to No. 320, depending upon the type of finish required.

Polishing of Fabricated Sheet Stock

The size of the grain used on sheet stock after it comes from the mills depends upon the condition of the sheet, and the absence or presence of die marks, and the depth of these marks. The best practice is to use a No. 120 or No. 140 (G.M.S.) grain size to remove the die marks, and follow with No. 170 (G.M.S.) or No. 200 (G.M.S.) to remove these scratches. Number 170 (G.M.S.) or No. 200 (G.M.S.) is usually coarse enough to remove any marks which may be found in the stock, and prepare it for the following operation which should be No. 280 or 1F. The No. 280 or 1F should be followed by a tampico brush for certain finishes using a fine abrasive paste as the cutting agent. The surface speed of the tampico brush should be approximately 7000 s.f.p.m. It is possible to omit the tampico brush on very small parts, and use a quilted sheep-skin wheel instead of a rag wheel on the operation

when No. 280 or 1F is used. The part is then ready for the buffing wheel.

Polishing of Stainless Metal Castings

Differences in the structure of stainless metal castings and sheet stock necessitate a somewhat different procedure in the polishing.

Castings have an outside shell which is very difficult to penetrate and it is necessary to use a much coarser grain for the roughing operation than on sheet stock. It is often necessary to use a No. 36 grain to cut through this shell and remove it. On forgings No. 60 grit is generally coarse enough to cut through the shell.

A No. 100 or No. 120 grain will remove the scratches made on the castings, during the roughing operation. The following operations are the same as in the polishing of sheet stock. Number 120 grit is followed by No. 180 or No. 220, and that by 1F or 2F. On certain types of castings it is not necessary to use as fine abrasives for the final polishing operation before buffing as this material cuts more easily than does the sheet stock and the buffing wheel will remove the scratches made by the polishing wheel.

The first and second set-up wheels should be used dry but an abundance of grease or tallow should be used on the other operations. Several types of wheels are employed. On table cutlery, the compressed wheel is generally selected. A sewed buff or rag wheel is also used on the first two operations and a quilted sheep skin or felt wheel depending on the shape of the piece being polished will give the best results on the last operations.

Buffing

Buffing is the final step in producing a high mirror finish on stainless steel. The buff should be run at a surface speed of 10,000 to 12,000 r.p.m. The quality of the buff should be a high count sheeting such as 88/88 or 84/92, spiral sew of $\frac{1}{4}$ or $\frac{3}{8}$ inches. A buff of low count should not be used as a buff cannot cut too much on stainless steel.

The cost of buffing stainless steel is still out of proportion to polishing as compared to other metals, but there has been a decided reduction compared to the first efforts in polishing and buffing this metal. This reduction has resulted from improvements in buffing compounds, but principally from more time and effort spent in polishing the metal in preparation for buffing.

The amount of grease used in buffing compound varies according to the finish required and the condition of the piece as it reaches the buff wheel. Where it is necessary to cut out fine scratches, enough bond should be used to hold the compound on the wheel so that the operator will not try to force the cutting action and "burn" the metal. It must be remembered, however, that too much grease will tend to leave a cloudy finish and where a high lustre is desired, less grease should be used.

Several fine buffing compounds are now made by the suppliers, though in all cases where materials are being selected it is good practice to be certain that they are substantially free from iron or other corrosive materials which might be deposited on the surface during buffing, and later tarnish or discolor.

As in the polishing of every other metal, there is no single set of grain sizes or materials which can be specified for each step in the polishing and buffing of this material. Varying conditions in each instance call for slightly different recommendations.

Developments in Non-Ferrous Metals

Metals and Finishes Will Play an Important Part in Solving the Problem of Machine Age Housing

THE development of new ideas in domestic as well as business and industrial housing is believed in many well-informed quarters to hold wide possibilities for the metal industries. The general belief is held that the American housing situation will ultimately resolve itself into a matter of mass production of dwellings, probably on a scale resembling in technique and greatly exceeding in extent the modern automobile industry. If this is so, the metals seem destined to play an all important part in what has been termed the coming "housing revolution."

The illustration here shows an all-metal five-room house



Photo, Creative Studios

Metal and Glass "House for the Machine Age" Designed by Buckminster Fuller.

which was designed in anticipation of the change to which we refer. Buckminster Fuller, New York architect, recently exhibited at the Hotel Winthrop, New York, a model of this house, and explained its amazing construction and facilities.

The house is built, roughly speaking, of glass and metal. It is designed to provide a "machine in which to live," with a maximum of convenience and efficiency. Having walls largely of glass, no daylight is lost. The central mast takes the place of the customary house foundation, and the several "decks" and the roof are all suspended from the mast. Provision is made for revolving the house to place any room in the way of direct sunshine, or out of it, as may be desired. Conventional architectural beauty has been ignored in the interests of providing a completely scientific house for people of the machine age.

The interior is divided into rooms which radiate from the central mast, and which are separated from each other by metal walls decorated to suit the occupant. Non-ferrous metals are used for fittings of various kinds, except where plastic materials have been found desirable, as for certain of the electrical devices.

However, the novelty of the Fuller house is not merely its unusual construction. It is intended to be a completely self-contained dwelling unit. Thus, there is equipment for generating electricity by means of gasoline, oil, Diesel or other motors now available for the purpose, or by the use of an engine which operates on gas generated in disposal of the garbage and other refuse. With the electricity the house can be heated, cooled, lighted, revolved and otherwise operated.

The house was designed with the idea of using metals as follows: duralumin or other aluminum alloy for decks, interior walls, roofing, and many other parts; copper, tin, lead, zinc and practically all of the nonferrous metals, both base and rare, in the plumbing, machinery or other equipment; steel for suspension cables and a number of other parts. A very wide variety of finishes would be employed, of course.

Mass production of this type of house, in a variety of sizes but on the same basic principle, is contemplated, but no definite information in this regard is available at the present time. METAL INDUSTRY will endeavor to keep its readers informed of this and all other developments affecting the industries it serves, as rapidly as possible.

A Relic of the Early Brass Industry

PLANs are under way to preserve a relic which is reminiscent of the brass industry around Waterbury, Conn., in the last century. This is the old water wheel which in 1846 supplied power to the mill of the Waterbury Brass Company, then the largest brass mill in the United States, and predecessor of the present American Brass Company. Naturally, the American Brass Company is interested in the preservation of the old wheel, which the company presented some years ago to the city, and which still stands in the Mad River, now a part of Hamilton Park, Waterbury.

In order to prevent further deterioration of the wheel, already seriously damaged by weather, it is now planned to place over it a protective frame or roof, preferably of copper, which has the required corrosion resistance and which is deemed very appropriate as the material of which to construct a protection for this relic of the largest copper-consuming industry, brass, the world's center of which industry is Waterbury.

Draftsmen of the American Brass Company have submitted designs, and it is very likely that a roofed copper shed will soon be placed over the wheel. The copper will be treated to lend the appearance of age to the new metal, and thus continue the antique appearance of the wheel and its surroundings.

EDITORIALS

Metals and the Building Industry

Without question, one of our greatest industries—in terms of number of men employed and quantities of materials consumed—is building. It has been estimated that, including repairs and replacements, its annual volume has been as high as \$10,000,000,000. To us who are engaged in and dependent upon the metal industries, the building industry is perhaps the most important of all, because of the quantities of metals, metal products and metal finishes which it requires. Its importance is clearly evidenced by the efforts of the prominent metal producing companies to find additional uses within it for their metals.

A large part of the metal industries are waiting "patiently" for building to revive. They have been asking again and again the same question—"When?" But this is not the only question involved. We must also ask ourselves "How?" Both questions are unanswerable in exact terms. "When" depends upon a revival in business and the replacement demand due to depreciation. But depreciation is low in buildings—perhaps 2 per cent per year. How, then, is building to come back soon?

If the building industry is to revive to any extent in the near future, it will probably be in a different form. We know that for some time at least, factory building for expansion will be at a minimum. There may be government and institutional construction, but the volume of this type of work will be small in comparison with the totals involved in national building operations. What is left? Homes—and there lies the answer to the question "How?"

According to the results of an investigation by the F. W. Dodge Corporation, the rate of increase of the population of the United States is declining. The boom days are over for home building along old lines. We have plenty of apartments available at \$15 per room per month. There is a surplus of family dwellings at \$7,500 or more. In other words, the expensive and upper middle class dwellings are out of the picture—over-built for some time to come. What is left?

The building industry has recognized the fact that there is a huge market for homes—single family dwellings and apartments at very low cost; let us say houses at \$4,000 or less and apartments at \$8.00 per room. Under present conditions and with our present methods, such prices are impossible. But we are strong in the belief that this will not be true indefinitely. Twenty years ago if anyone had predicted the building of 40 H. P. automobiles to sell for \$500, he would have been clapped into an insane asylum. But we have these automobiles today and they are good. The answer for buildings at low cost is the same as for automobiles—mass production.

This means, of course, radically new designs. It means a revolution in methods of manufacture and methods of assembling. But even more than that, it means a complete change in the materials used.

It must be clear that the material better suited, perhaps than any other, to mass production, is metal. Aside from steel, which has long been the leader in adapting itself to automatic handling, we have copper, zinc, lead and their alloys which are workable, formable and finishable in an endless variety of shapes. Moreover, they are low priced, especially when their durability is taken into consideration. Aluminum requires no introduction or description, as its excursions into every conceivable field are well known. It is also low priced when its light weight and large volume are considered. Nickel has extraordinary strength, wearing qualities and a lasting finish.

All of the non-ferrous metals lend themselves to special decorative effects and these will be indispensable in the new type of building. The public has been taught to demand beauty—rightly enough—and without beauty any development in housing will be a failure. Mass production houses need not be ugly. They need not all be the same size and shape. There can be variation in design, size, coloring and finish, which will make such houses fully as attractive as anything we have today.

We hope the building industry finds its way out. We hope and believe also that the metal industries will be alert to grasp their opportunities when they arrive.

Government in Business

With the platforms of both political parties now presented, and with the campaign drawing towards its active stage, we may form certain conclusions about the course of our Government, regardless of the results of the election.

We have been used to hearing for many years the slogan "Less Government in Business—More Business in Government." We must know by this time that the first half of this slogan is definitely obsolete. The record of the present administration, with the organization of the Farm Relief agencies such as the Farm Board, and recently, the activities of the Reconstruction Finance Corporation, have proved beyond doubt that Washington is definitely committed to aiding business directly, by the use of both credit and money. The prospects are that the Democratic program will go at least as far and perhaps further.

Moreover, the attitude of the country seems to be changing. Only recently we noted with considerable interest an editorial in one of our greatest industrial journals which read as follows:

"We do not minimize in the slightest degree the vast good already done in allaying fear and in meeting the emergencies of financial and physical relief. Nevertheless we believe that a non-partisan super-board of economic planning could accomplish much more. . . . Such a board of strategy as we believe is now called for, made up of outstanding men in industry, finance and labor would be of incalculable help in putting first needs first and in building confidence and loosening credit."

There are many who believe that it is only a step from loans to industry to the ownership of industry. What will happen if these industries fail to repay their loans? However, about that we do not care to prophesy.

The second half of the slogan "More Business in Government" is something devoutly to be wished for. Let us hope for the best. The art of Government is far behind our technical sciences. Will Government learn to control business operations if it has to engage in them?

Regardless of opinions and beliefs about the rights and wrongs of the matter, the trend of the times seems to be unmistakable. We are getting, and probably will continue to get more Government in business.

Standards for Quality

The Pewter and Hollow Ware Manufacturers' Association has taken a notable stand in the interest of its own well-being and as an example to industry as a whole. At its recent meeting it formulated a comprehensive program which included the re-classification of standard lines; the elimination of loss leaders which have usually involved the lowering of quality; the use of heavier gauge metal in the standard lines; the adoption of a stamp of quality—"Quality Pewter—Free from Lead," the licensing of the members of the Association to use its seal, and an advertising campaign to support the quality standards; and the posting of a cash bond by members to maintain the quality standards.

The Association is working to obtain the co-operation of manufacturers of raw materials and the retailers of its products. New designs are to be registered with the Association and arbitration machinery set up to adjust disputes concerning originality or priority of design. The object is to eliminate piracy of designs, which is always followed by price-cutting and cheapening of quality.

Such a program needs no praise. It stands on its own feet as an example of progressive, energetic action. If the Pewter and Hollow Ware Manufacturers' Association stands firm, it will serve as a shining light to industries vastly greater in size. It will earn the thanks of the manufacturing interests and the public of the entire nation.

Remelt Aluminum

Probably the most uncomfortable result of this period of depression in industry has been the pressure upon producer, fabricator and manufacturer to reduce prices. It is perfectly natural, of course, but it has been aggravated by intense competition. One of the results of this pressure for reduced prices in the metal industries has been the use of secondary or scrap metals for the manufacture of articles which were formerly made only with new or virgin metals. In the brass foundry this is an old story, as by now the vast majority of castings are made from remelted and re-alloyed scrap. Brass and bronze ingot, made of secondary materials, has also been so improved that it is, for practical purposes, the equal of new metals. The same applies to aluminum in the brass foundry.

The rolling mill and fabricating plant, however, have always been considered different. There, the metals are subjected to such severe treatment that the highest purity was necessary, and the rigid specifications set up excluded secondary material. Still the pressure for lower costs has forced manufacturers to keep on trying. As a result, we are told that in many cases remelt metal is now being used for rolling in places where it was formerly considered unsuitable.

In the case of aluminum, there is still considerable divergence of opinion on this question. One large producer of aluminum states that so far as they know "remelt aluminum is the same remelt aluminum as it has always been, unsuitable for any additional applications in new fields."

One rolling mill man states that in his experience, which is limited to aluminum in crucible melts, he had little success in producing it as a high grade metal. "It is a hog for oxygen and our metal failed because of excess aluminum oxide." Another specialist in the production of aluminum in fabricated form, states definitely that "remelt aluminum is undoubtedly being used now for many purposes where it was formerly considered unsuitable—the latter due to prejudice in many instances. Also the quality of remelt has been much improved. Properly made secondary metal of the right composition can be and is being used for any and all purposes where primary is employed. Remelt has been used in sheet rolling for many years." A die casting specialist states that for some years aluminum die castings have been made largely from remelt; at this time about 75 per cent of the aluminum die castings in this country are so made.

This difference of opinion is only natural as the industry is still in the transition period. Nevertheless, it seems to be directly in line with the times—a better product in the case of secondary metal and lower prices for finished products.

Tin Plated Automobile Pistons

Even in hard times like the present, progress continues and new developments arise. Within the last year a new use for tin has appeared in the automotive industry. Cast iron pistons are now being plated with tin in order to reduce the friction between piston and cylinder wall. The coating is, of course, very thin, varying from 0.0005" to 0.001". The plating process is not difficult and recent developments in tin solutions have facilitated work along these lines.

Here is a field for electroplaters to watch. If it continues to grow, there should be a large amount of repair and replacement work in tin plating pistons.

"Help" Wanted

It has been called to our attention that in a number of cases individuals and firms have answered advertisements of men looking for work, offering these men positions—providing they made cash investments in the business in which they were to be employed. In some cases, perhaps, these were bona fide offers. In other cases the firm was in financial difficulties and wanted a substantial investment to help tide it over the hard times. But in a number of the cases, according to reports, a racket is carried on by which the man looking for a job is mulcted of anywhere from \$25 to \$100 and then left high and dry.

There are all sorts of crooks and all sorts of racketeers, but this appears to us as the cheapest and lowest form of thievery. We warn our readers never to send money without investigation. We warn them also that any firm asking for an investment from the man they want to hire, is probably in such financial difficulties that it is not safe to work for them.

Investment in business is legitimate, but paying for a job is not exactly an investment. If a firm cannot afford to pay its help without the assistance of new employees it has no right to be in business.

Correspondence and Discussion

Metal Industry Invites Correspondence on Subjects of Interest to Its Readers.

Cleaning Aluminum Tanks

Editor, METAL INDUSTRY:

The item dealing with the cleaning of aluminum gasoline tanks, which appears on page 146 of the April, 1932 issue of METAL INDUSTRY, has just been called to my attention. Unfortunately, I can not subscribe to the answer given by Dr. H. M. St. John to the question regarding the corrosion of the tanks during the cleaning operation. I believe, however, that the manufacturer of these tanks will find the following comments helpful to him in overcoming the difficulties he is encountering from corrosion.

The principal reason for washing aluminum gasoline tanks with sulphuric acid after fabrication is to remove any residual welding flux. If this flux is allowed to remain inside the tank, corrosion is likely to occur in the presence of moisture.

The manufacturer, therefore, is following the proper procedure in washing the tanks with a 10 per cent solution of sulphuric acid. But it is highly desirable in all cases in which sulphuric acid is used as a pickling agent for aluminum that the acid be free from the salts of the heavy metals. The fact that the fabricator stores the acid solution in lead lined wooden tanks would indicate that the acid contains lead salts and, undoubtedly, these salts are causing a galvanic action to take place and corrode the aluminum.

We would also suggest that instead of immersing the tanks in a solution of sulphuric acid, the manufacturer wash the tanks out with a smaller quantity of lead free acid by agitating the acid

vigorously inside the tank. This operation, of course, should be followed by rinsing the tank carefully and thoroughly in clean hot water.

ALUMINUM COMPANY OF AMERICA,
Pittsburgh, Pa. S. K. Colby, Vice-President.

I am not sure that Mr. Colby fully appreciates the problem which was submitted. The use of sulphuric acid to remove welding flux from the tank may be quite necessary, as he states. Whether or not the sulphuric acid used contains lead is a matter of somewhat secondary importance. The presence of lead is likely to result in spotting of the aluminum, but the really important point is that the sulphuric acid must be entirely and thoroughly removed from the tank in order to prevent subsequent corrosion.

H. M. ST. JOHN.

"A Great Help to Me"

Editor, METAL INDUSTRY:

Enclosed find check for renewal of my subscription.

Your magazine has been a great help to me from time to time, and I would not do without it. I consider it a liberal education in itself, and am entirely satisfied with it, knowing it will keep us informed of all advances in the trade. I have been a subscriber for 20 years.

Warsaw, Indiana.

PAUL GRIMM.

New Books

Platers' Guidebook. By Oliver J. Sizelove. Published by METAL INDUSTRY, 116 John Street, New York. Size, 5 x 8, 48 pages. Free to METAL INDUSTRY subscribers.

This is the third edition of a work that has proved highly useful to the electroplating and metal finishing industries, to manufacturers, plant executives and to the men actually engaged in finishing. The present edition is a revision of the first Platers' Guidebook, which appeared two years ago. It contains the formulas for all the standard electroplating solutions, as well as for solutions used in coloring of metals. There is also a section giving instructions for the analysis of plating and finishing solutions, a list of chemicals used in the testing of solutions, and a table of conversion factors. As in the past, the book, while highly technical and completely scientific and accurate, is written in language and style which make the information clear to the practical man in the shop.

Testing Precious Metals with the Touchstone, by C. M. Hoke, consulting chemist. Published by the Jewelers Technical Advice Company, 22 Albany Street, New York City. Size 4½ x 8; 24 pages. Price, 50 cents.

This booklet is just off the press. It comprises a succinct but exhaustive text on practical testing of the precious metals. (The material contained is being run in serial form in BRASS WORLD).

The touchstone method for testing gold alloys has long been used in the precious metal trades. It has now been extended for use in testing platinum, palladium, silver, white golds, dental alloys, and nickel as well; also for testing solutions containing these metals.

The methods are thoroughly tested and are simple but effective. It is believed that this booklet makes available the

first complete description of these tests, some of which are original with this author. The book describes fully the equipment needed and the procedures used.

A Planned Society. By George Soule. Published by the Macmillan Company. Size 5 x 7½; 294 pages. Price \$2.50.

Here is an unusual work. It is unusual not because it recommends a plan for stabilizing our industrial organization—there are many such plans—but because of the type of plan which it puts forth.

The author deals with the central problem of our civilization. Without mincing words, he declares our present system unsatisfactory. He does not, however, like most dissenters, recommend a revolution or following in the footsteps of Russia. The author asserts that we must create a new type of order in the United States—a rational and planned economy, which will not only make use of science but preserve liberty and the rights of the individual.

A good part of the book is historical in character, helping the reader to understand the background of our present difficulties. The plan offered is necessarily general in character, as the author recognizes the fact that details must be worked out as we go along. He believes in a National Economic Council, which will correlate the many and widely varying industrial activities of the United States.

Many will disagree with the author's point of view and with his conclusions. But regardless of agreement or disagreement, the book is most stimulating and is to be taken seriously.

Elementary Course in Chemical Analysis of Plating Solutions. Published by the Philadelphia Branch of the American

Electroplaters' Society. Size 9 x 11½; 18 pages. Obtainable from Albert Hirsch, 1945 Airdrie St., Philadelphia, Pa. Price \$1.00.

This is a compact and well-written booklet containing directions for sampling solutions, the use and care of apparatus, the preparation of standard reagents, the analysis of nickel, cyanide copper, and chromium solutions.

Profits from the sale of this booklet will be donated to the Research Fund of the American Electroplaters' Society. But aside from this worthy element, it is well worth having in the library of every plater and plating chemist.

Beryllium. Published by the Siemens Company, Germany. Translated by Richard Rimbach and A. J. Michel. Published in English by the Chemical Catalog Company. Size 6 x 9; 331 pages. Price \$10.00.

This book contains reports exclusively devoted to beryllium, its production and use, covering the work done since 1923 by the Siemens Konzern in Germany. It presents, between the two covers, a vast amount of data which has been accumulated in Germany during those nine years.

Chapters are devoted to alloys of beryllium with non-ferrous metals which will be of special interest to the metal industries in the United States. Beryllium copper alloys are stressed, but beryllium nickel and beryllium silicon alloys are also discussed.

The book will be immensely valuable for its service in bringing together in compact form the progress made in the development of a new and promising commercial metal, by pioneers and leaders in the art.

Standard Methods for the Sampling and Analyzing of Aluminum and Certain Aluminum Alloys. Published by the Aluminum Research Institute, Chicago, Ill. (Technical Pamphlet)

This is a new bulletin published by the Aluminum Research Institute, an association composed of smelters and refiners of ingot aluminum and its alloys. Standard methods of analysis to be used by all its members are given for copper, iron, lead, magnesium, manganese, nickel, silicon, tin and zinc—all as contained in aluminum and aluminum alloys. A description of the best sampling procedure is also given.

The methods of analysis described are what is known as "Medium Grade," to be used for the valuation of materials for purchase, sale or duplication and checking of specifications. The cost of analysis by these methods is moderate. The methods are recommended for pure aluminum (containing not over 99.50% aluminum); aluminum containing up to 15% copper; 10% silicon; 5% magnesium; 1.50% manganese; 5% nickel; 20% zinc; 10% iron; 5% tin; 0.5% lead. The methods are not recommended for the "intermediate" or "hardener" group of alloy such as those rich in copper, silicon, nickel, etc., for use in introducing known amounts of these metals into aluminum.

The Journal of the British Institute of Metals. Volume 47, 1931, published by the British Institute of Metals, 36 Victoria Street, Westminster, S. W. 1, England. Size 5½ x 8½; 854 pages. Price £4.

This is the first volume of the Journal of the Institute of Metals to be devoted entirely to metallurgical abstracts. It constitutes No. 3 of the 1931 bound volumes of this Institute and marks a change in the policy of this Society, which has for some time included these abstracts in its half yearly volumes and recently issued monthly, paper-bound booklets.

The inclusion of abstracts within the covers of a separately bound book should receive a warm welcome from all who have to consult metallurgical literature. There are 5,000 up-to-date summaries of papers and articles in this edition dealing with material which has been published throughout the world. They have been compiled by a staff of 46 experts, given by name, who are known to be leaders in their profession.

The subject matter, entirely concerned with non-ferrous metals and alloys, is classified under 20 headings, making reference easy. In addition there is a name and subject index.

Metal Statistics—1932. Published by the American Metal Market, New York. Size 4 x 6; 504 pages.

This year's edition of this well-known annual contains the same assortment of statistical information concerning metals which has been supplied in previous years. Various new

tables have been added, however, on industrial production, copper production, magnesium, silver and tin.

World Tin Statistics for 1932. Published by the Anglo-Oriental Mining Corporation, Ltd., 5561 Moorgate, London, E. C. 2, England. Size 4 x 6½; 137 pages.

This little book contains compiled and tabulated statistics regarding the production, consumption and stocks of tin, together with tables showing the history of price changes. An interesting foreword by John Howeson, chairman of the Anglo-Oriental Mining Corporation, explains briefly the organization of the International Tin Committee and its program for the control of the industry.

Copies can be obtained from L. J. Tavener, Room 2810, 149 Broadway, New York City.

National Directory of Commodity Specifications. Published by the Bureau of Standards. Size 8 x 11; 548 pages. Obtainable from the Superintendent of Documents, Washington, D. C. Price \$1.75.

This book is a classified and alphabetical list, with brief descriptions, of specifications formulated by the national technical societies and trade associations, or other organizations which speak for industry, or with the authority of the Federal Government as a whole. It includes also specifications of the Federal Specifications Board, covering, so far as they have been issued, the materials and supplies purchased by the Government.

Items of special interest to the non-ferrous metal industry are as follows: aluminum; antimony; bismuth; cadmium; cobalt; copper; brass; bronze; lead; mercury; nickel; precious metals; metal jewelry; plated ware; clocks, watches, dials; tins; zinc; miscellaneous ores; metals; alloys and metal manufactures; metal working machinery; acids and other chemical compounds; miscellaneous chemical products; scientific and professional apparatus and supplies; musical instruments.

Standards Year Book for 1932. Published by the Bureau of Standards, Department of Commerce. Obtainable from the Superintendent of Documents, Washington, D. C. Size 6 x 9; 394 pages. Price \$1.00.

Business and industry are now thoroughly familiar with this annual volume and it needs no introduction or praise. The subjects covered range from accident prevention to zoning systems and include references to important work having a direct bearing on reducing the cost to the public and increasing the profit of manufacturers of a wide range of articles. The sections on national and international standardizing agencies contain information not found elsewhere in one volume. Sections of the book contain brief reports of the work of standardizing bodies within the Federal Government and of states, counties and municipal agencies, as well as technical societies and trade associations.

Year Book of the American Bureau of Metal Statistics. Published by the American Bureau of Metal Statistics, 33 Rector Street, New York City. Size 8¼ x 10½; 112 pages. Price \$2.00.

This annual statistical compilation is now in its 12th year. This edition (1931) covers the production, imports and exports, consumption and prices of copper, lead, zinc, gold, silver and numerous miscellaneous metals such as platinum, antimony, nickel, tin, aluminum, cadmium, etc.

It is an indispensable part of the library of every business engaged in or using considerable quantities of non-ferrous metals.

Practical Handbook on Electroplating. By W. Canning and Company, Ltd., Birmingham, England. Size 6 x 9¼; 329 pages.

This is the 11th edition of a practical plating handbook which is well known throughout England and familiar to many of us in the United States. It does not claim to be a scientific treatise but it is intended as a practical workshop guide for the use of works managers, foremen and electroplaters.

The new edition has added chapters with up-to-date information on chromium plating, cadmium plating and the special features of automatic plating. The old sections have been brought up-to-date on such topics as grinding, polishing, cleaning, dipping, etc.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

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Electroplating, Polishing, and Metal Finishing

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G. B. HOGABOOM

A. K. GRAHAM, Ph.D.
WALTER FRAINE

Battery Clamp Alloy

Q.—I need a formula for an alloy to cast battery clamps which should resist dilute sulphuric acid.

A.—One of the best mixtures would be 90% copper and 10% aluminum. This metal can be poured in permanent molds if desired.

W. J. R., Problem 5,114.

Brass Plating

Q.—Would you suggest using copper anodes in a brass solution? I have been informed through a friend that this can be done.

A.—It is possible to use copper anodes in a brass solution, but we do not recommend their use. We prefer to use what is known as an 80-20 anode. This is an anode that contains 80% copper and 20% zinc.

O. J. S., Problem 5,116.

Bright Nickel on Keys

Q.—Will you please inform us, through your METAL INDUSTRY, how we can finish articles made from steel, the same as key enclosed?

A.—The sample key has been finished as follows.

Steel ball burnished and then nickel plated in a barrel solution. Cadmium has been used as a brightener.

Any good working nickel solution can be used, and the cadmium is either added as cadmium chloride, or else a cadmium stick has been hung into the solution.

An excess of cadmium should be avoided, as it will cause a dark colored deposit. Usually an ounce of cadmium chloride to 100 gallons of solution will produce results.

O. J. S., Problem 5,115.

Corrosion of Iron and Brass

Q. 1—I know a tinner here who made up a large copper tank to hold rain water which naturally contained coal soot. He used tinned iron rivets in the seams with the result they soon dropped out from a chemical action. What I wish to learn is this. I have some brass castings which I wish to make fast to a hot water boiler which is iron my idea is to use brass screws and tin them to make a joint in the threads. Will this be all right, or am I likely to experience the trouble mentioned above? If so what will be good practise?

2. I have a copper vat to which I wish to solder a brass plate; also some cast brass spuds for iron pipe connections on the vat. Shall I experience the above trouble with the brass to copper and the iron pipe to the brass to iron thread, both vat and iron pipe to buried in the ground? I also will have an iron storage

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all blanks if possible.

Date

Name and address: Employed by:
Kind of solution: Volume used:
Tank length: width: Solution depth:
Anode surface, sq. ft.: Cathode surface, sq. ft.:
Distance between anode and cathode: Kind of anodes:
Class of work being plated: Original formula of solution:
REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail it to METAL INDUSTRY, 116 John Street, New York City.

tank close to the copper vat under ground. Both vat and tank will contain gasoline.

A.—If the parts that you wish to assemble come in direct contact with moisture there will be a rapid corrosion of the iron. That is what happened with the copper tank on which steel rivets were used. In this case the action was accelerated by the coal soot which probably formed an acid condition in the water.

In your first problem the corrosion will be very slow as the boiler will keep the parts dry and there is no direct contact with water.

In your second problem corrosion will take place and the life of the job will depend upon the nature of the soil which surrounds it. There will be no trouble with the brass and copper but it would be advisable to use a brass pipe instead of an iron one.—G. B. H., Problem 5,117.

Re-Blueing Guns

Q.—Will you please give formula and method for Re-blueing guns?

A.—The blue finish that is seen on revolvers is produced by a heat treatment method. For refinishing, the old finish should be removed by the use of a hot muriatic acid dip. The work should be repolished, thoroughly cleaned, and placed in a muffle furnace and heat to 550° F., for 10 to 15 minutes.

The method of producing a blue black or gunmetal finish is as follows. After the work has been polished and cleaned it is placed in the following solution for 10 to 15 minutes.

Ferric chloride	2 ounces
Mercury nitrate	2 ounces
Muriatic acid	2 ounces
Alcohol	3 ounces
Water	8 ounces

After immersing the work in this solution it should be hung up to dry for 10 to 12 hours. Repeat the immersing and drying operations, then brush lightly with a fine crimped steel wire wheel. Finally oil with paraffine or linseed oil and remove excess of oil with a soft cloth.—O. J. S., Problem 5,118.

High Strength Metal

Q.—Please find enclosed a casting of a mixture that we have tried and would like to know if you could improve on same to make it harder and give it more wall tension. It should be forged and give a gloss on wearing surface. I am sending a cast iron ring that we make so you can see what we want. Following mixture consists of in 10 pound mixture as sample:

- 2 lbs. nickel—Grade F shot.
- 1 lb. chrome copper (88-90% copper (8-11% chrome).
- 6½ lbs. copper.
- 4% Swedish iron.

This is more like steel than iron. Would cast iron be better for this class of work?

A.—The mixture you are using:

- 2 lbs. nickel.
- 1 lb. chrome copper (10% chrome).
- 6½ lbs. copper.
- ½ lb. Swedish iron.

This mixture equals:

- 20% nickel.
- 1 chrome.
- 74 copper.
- 5 iron.

We would think this metal would be hard to run into such castings as you want, as it would be sluggish and set quickly. We would suggest you change this mixture to:

- 2 lbs. nickel.
- 1 lb. 10% chrome copper.
- 6 lbs. copper.
- ½ lb. tin.
- ½ lb. Swedish iron.

Swedish iron is the best iron to use in brass or bronze mixtures as it is a pure iron. Cast iron is not suitable as it causes hard spots and will not alloy with copper so readily on account of the carbon.

There is a mixture we would suggest as worthy of a trial, and

it may meet your requirements. The Westinghouse Air Brake Company has used it for piston rings for 30 years. It is composed of: 77% copper, 21% tin, 2% zinc.

Only virgin metal is used; the best grade of electrolytic copper, Straits tin, and best grade of zinc. The castings are cast in cylinders and heat treated before machining. The heat treatment consists of heating the casting up to a cherry red and quenching in water. This gives a very springy metal and may meet your requirements.—W. J. R., Problem 5,119.

Small Scale Zincing

Q.—Can you give us information regarding galvanizing by the hot dip process? We find there is no concern in this locality doing this kind of work and whenever we require articles to be finished in this manner, it is necessary to send them away.

We expect shortly to have an order which would require this method of galvanizing on about 3½ tons of gray iron castings and are wondering if it would be worth while to set up equipment to perform this work.

A.—Hot galvanizing, even on a small scale is a very costly process unless sufficient tonnage is always in sight to have continuous operation of the kettle. The reason for this is that it does not pay to install a very small pot due to the fact that standing under heat will very soon ruin the quality of the zinc. Also, if the tonnage is not sufficient to take out considerable zinc, the bath becomes sluggish, and the quality of the coating poor. Peeling and flaking of the coating, and other very undesirable features are particularly liable to develop with a very small bath, not used very often.

Zinc forms an alloy with iron which renders about 96 parts of zinc useless for every four parts of iron dissolved. A continuous production tends to carry out zinc from the bath which is saturated with iron. New zinc very low in iron content, must be added to that carried out as coating, and in this way the zinc in the bath is kept in good condition for galvanizing. When the production is very low, and the bath stands for days at a time without operation and idle under heat, the zinc slowly takes up iron which multiplies and will in time ruin the entire bath and make it useless as metal for a zinc coating.

The very smallest installation that would be practical would cost at least \$1,000 and this could only take very small work. Pickling tanks, a galvanizing furnace, zinc, and many other galvanizing materials are necessary to carry on the process. Unless an outside jobbing tonnage can be obtained to be assured of continued operation of the pot it will not pay to install an outfit just for hot galvanizing 3½ tons of castings.

Castings are very difficult to galvanize properly and special treatment in hydrofluoric acid after sand-blasting is necessary.

It may, therefore, be definitely stated that for an occasional order of 3½ tons of castings, it is much cheaper to have them galvanized out, than to attempt to install a small plant of your own.

W. I., Problem 5,120.

Smelting Aluminum

Q.—We are melting aluminum scrap in a 10,000 pound reverberatory furnace. Everything seems to be alright with the exception of the recovery. We thought that since we use nothing but clean scrap material that our recovery ought to run from 94% to 96%, but instead we are obtaining a whole lot less. Will you kindly advise us, in your opinion, what you would consider to be a good recovery, taking into consideration the fact that we use only clean scrap materials? Also please advise us the best flux for our particular purpose."

A.—If you are smelting clean aluminum scrap free from dirt and grease you should recover from 94 to 96%. It is necessary, however, to use a flux in smelting secondary aluminum, and the fluoride type of flux is the one generally used, as it has a chemical action on the metal and a positive solvent action on aluminum oxide, dissolving suspended oxide from the metal. The flux should also be cheap, so we suggest: 85% rock salt, 15% cryolite.

There are other fluxes recommended by Dr. Robert J. Anderson in one of his papers—85.15 sodium chloride-calcium chloride.

Fluoride flux is used considerably in secondary smelting practice, either as such or with addition of cryolite. Also sodium chloride fluxes are used in one form or another to suit conditions in secondary smelting of aluminum.—W. J. R., Problem 5,121.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,850,819. March 22, 1932. **Alloy.** Romaine G. Waltenberg, Roselle, Henry Edwin Holbrook, Irvington, and Bert Brenner, Elizabeth, N. J., assignors to The H. A. Wilson Company, Newark, N. J.

An alloy containing iridium to the amount of about 70% and the remainder made up of one or more of the metals platinum, palladium, rhodium, and ruthenium.

1,850,997. March 29, 1932. **Production of Resistant Silver Surfaces.** Peter Assmann, Ludwigshafen-on-the-Rhine, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, Frankfurt-on-the-Main, Germany, a Corporation of Germany.

As new articles of manufacture, silver articles having a highly resistant surface of an alloy of silver with a metal less electro-positive than silver and capable of forming solid solutions with silver, said surface being supported by a less resistant silver-containing material.

1,851,130. March 29, 1932. **Process of Treating Zinc Skimmings.** Kenneth V. B. Rossman, Trenton, N. J., assignor to Federated Metals Corporation, New York, N. Y.

Process of substantially eliminating chlorides from zinc skimmings, which comprises introducing same into a multiple hearth furnace, rabbling the zinc skimmings over the several hearths successively while applying gradually increasing temperatures thereto and with the admission of a limited amount of air.

1,851,140. March 29, 1932. **Alloy.** Charles William Thomas, Redford, and Vincent Weaver Allen, Detroit, Mich., assignors to Revere Copper and Brass Incorporated, Rome, N. Y.

An alloy consisting of copper 50 to 95%, zinc 5 to 49%, and aluminum 0.1 to 0.25%.

1,851,218. March 29, 1932. **Alloy.** Joseph C. R. Stone, Belmont, Mass.

Alloys containing by weight approximately from 17 to 35% nickel, 0.5 to 2% tin, 0.04 to 1.5% lead, with the balance approximately all copper, the amount of lead in each particular instance not exceeding the amount of tin.

1,851,219. March 29, 1932. **Method of Electrodeposition of Zinc.** Uryln C. Tainton, Johannesburg, Transvaal, South Africa.

In the electro-deposition of zinc, the method of producing zinc deposits of great purity and ductility which consists in using an anode composed of an alloy of lead with a small proportion of a metal electro-negative to lead, and carrying out the electrolysis in the presence of silicic acid.

1,851,603. March 29, 1932. **Method**

for Revitalizing Chromium - Plating Solutions. Thomas P. Thomas, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, a Corporation of Pennsylvania.

The process of revitalizing electrolytes that have been used in electro-plating of chromium which comprises passing a current through a solution containing chromic chromate, the electrodes being of such proportions that the cathode will have a current density of between 3 and 5 amperes per square inch and the anode will have a current density at or substantially below .3 amperes per square inch.

1,851,928. March 29, 1932. **Alloy.** Richard A. Wilkins, Rome, N. Y., assignor to Revere Copper and Brass Incorporated, Rome, N. Y.

Free cutting leaded brasses capable of hot rolling and drawing containing approximately from 60 to 70% copper, substantial amounts of lead up to 3%, substantial amounts of silicon up to 2%, and the balance approximately all zinc.

1,851,932. March 29, 1932. **Method of Finishing Metalware.** Andrew L. Fabens, Wooster, Ohio, assignor to The Buckeye Aluminum Company, Wooster, Ohio, a Corporation of Ohio.

The herein described method of producing a hardened and bright surface on wares stamped or spun from relatively soft sheet metal which consists in running against said surface, for a sufficient time to act uniformly thereon and produce the desired effect, a mass of relatively hard balls of different sizes.

1,852,162. April 5, 1932. **Refining of Copper.** James E. Harris, Newark, and John H. White, Cranford, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y.

Method of producing metallic copper having high electrical conductivity, which method comprises adding calcium boride to the copper when molten to deoxidize the copper.

1,852,434. April 5, 1932. **Zinc Base Die-Casting Alloy.** Willis M. Peirce and Edmund A. Anderson, Palmerton, Pa., assignors of The New Jersey Zinc Company, New York, N. Y.

A zinc base alloy consisting of 2 to 10% aluminum, copper in excess of 2% but not exceeding 6%, and the balance zinc metal of high purity containing less than 0.01% of lead plus cadmium.

1,852,581. April 5, 1932. **Coating Composition and Process of Making Same.** Gustave Klinkenstein, Newark, N. J., assignor to Maas & Waldstein Co., Newark, N. J.

The process of producing a surface coating comprising the application of a

layer of crystal lacquer to a base, applying coloring material to the crystal lacquer surface to give definition to the crystal formation thereof.

1,852,583. April 5, 1932. **Apparatus and Process for Treating Material Such as Metal Powder.** James H. Lucas, Elmhurst, N. Y., assignor to Nichols Copper Company, New York, N. Y.

In a drying apparatus in combination a drying chamber for receiving metal powder containing a liquid capable of producing a vapor substantially inert to the powder, means to heat the chamber to produce vapor from the liquid and vapor exit means for said chamber.

1,852,750. April 5, 1932. **Cleaning or Plating Tank.** Elmer A. Hooper, Bridgeport, Conn., assignor to The McCathron Boiler Works Co., Bridgeport, Conn.

A cleaning tank formed of two U-shaped sheet metal members positioned one upon the other with their bottoms in spaced relation to each other and welded together along their adjoining edges.

1,852,797. April 5, 1932. **Chromium Plating Process.** David Julian Block, Chicago, Ill., assignor to Apollo Metal Works, La Salle, Ill.

In the process of chromium plating, the step of absorbing and oxidizing gas formed at the cathode by means of gas absorbent charcoal and manganese dioxide to prevent polarization.

1,853,229. April 12, 1932. **Ferro-Aluminum-Silicon Alloy.** Byramji D. Saklatwalla, Crafton, Pa., assignor to Vanadium Corporation of America, Bridgeville, Pa.

A steel densifying and scavenging alloy, containing aluminum about 5% to 30%, silicon about 10% to 48.5%, the silicon being in excess of the aluminum, the balance being principally iron, and carbon not over about .4%.

1,853,323. April 12, 1932. **Colored Coating and Process for Producing the Same.** Joseph Schulein, Rockford, Ill.

A process for producing colored coatings upon the surface of zinc comprising passing of alternating electric current through solutions containing chromium using the zinc to be treated as one electrode and an insoluble metal as the second.

1,853,341. April 12, 1932. **Antirust Solution for Radiators.** Alexander Djidich, Tamaqua, Pa.

A solution of the character described, consisting of a saturated solution of copper sulphate and a saturated solution of soda ash.

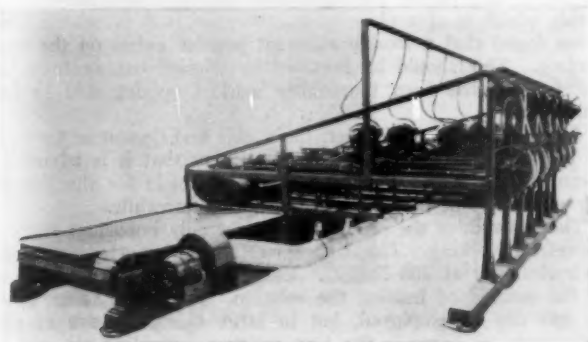
Equipment

New and Useful Devices, Metals, Machinery and Supplies

Excelsior Automatic Stainless Steel Polishing Machine No. 28

The Excelsior Tool & Machine Company, East St. Louis, Illinois, have recently placed on the market a new special polishing machine (patents pending). This new machine was specially designed for polishing large stainless steel sheets and is known as "Excelsior No. 28 Automatic Sheet Polishing Machine."

This is a "straight-line" polishing machine, polishing any width sheet up to 60" inclusive x 144" or longer, to a commercial finish in one continuous pass under a multiple of polishing belts. The process of polishing on this machine is continuous. The sheets are placed end to end on the endless belt conveyor, passing under a multiple of roughing and finishing polishing belts, at a constant



Stainless Steel Sheet Polisher Showing Partially Finished Sheet, and Dust Collecting Equipment.

speed and polished completely to the extreme edges of the sheet in one pass through the machine. The hold-down arrangement, to prevent the shifting of the sheet, is accomplished by means of rollers spaced equi-distant on each side of the polishing belts.

The endless polishing belts 7 inches wide and 8 ft. in length operate over two end pulleys, the inside pulleys are driven direct from 10 H. P. Dust proof ball bearing motors with a specially constructed intermediate idler pulley located between them for the purpose of contacting the polishing belt with the sheet. This self adjusting feature, produces a uniform and constant pressure extending over the entire working face of the polishing belt. The pressure on the polishing belts is regulated by weights provided for this purpose. The loose pulley spindle is eccentrically mounted with a tightening device to maintain the proper belt tension, thereby eliminating slippage of the polishing belts. The conveyor is adjustable with a speed ratio of 2 to 1, corresponding to 60 to 120 lineal feet per hour. The six belt machine illustrated requires a floor space of 38 ft. by 18 ft. Weight approximately 32,000 lbs.

Approximate capacity of a 16 spindle machine, depending on the quality of the sheets with a minimum of rolling defects: 300 square feet can be polished and buffed to a high luster in one hour in one pass through this machine, or two passes through an 8 wheel machine.

Any of the polishing belts can be removed (when dull) and replaced in two minutes, without interfering with the production or continuous operation of the rest of the spindles. The belts are easily re-set with the desired grain abrasive from 90 to 400, by the use of a special designed fixture devised for the purpose, which also reduces the thickness of both edges to avoid the feed marks on the polished sheets.

Plugging Defects in Castings Before Plating

By R. R. Shuman

Brass foundries have long been looking for a filler for plugging up sand holes and defects in castings, that would not pull out in filing or grinding; and which would take on nickel and other plating.

The Shedlov Manufacturing Company, Minneapolis, make a steam-heated necktie pressing machine. The buck, illustrated, is cast from red brass, surrounding a 3/16" steel steam pipe bent in the form of a "V". When the brass is poured over the steel tubing, blowholes develop in the casting. After trying various metals and alloys for plugging up these holes, preparatory to nickel plating, Robert Heinz, Superintendent, found that Handy & Harman's "Sil-Fos" Brazing Alloy solved the problem. Its fluidity at the low temperature of 1,300° F. causes it to penetrate every interstice instantly, clear to the bottom. It hardens quickly, and, when hard, is readily smoothed down by file or emery wheel, without becoming dislodged under the abrasion.

"Sil-Fos" is a patented alloy containing silver and phosphorus in combination with copper. The combination gives strength, ductility and penetrating qualities and lowers the melting point several hundred degrees below the temperatures required by spelter bronze or other commercial brazing alloys.

It is also used by brass foundries for mending cracks in brass or bronze castings, forming a joint claimed to be about as strong as the metals themselves.

A New Chromium Plating Process

A British firm of chemists have evolved a process known as the Stella Chromium Plating Solution, which it is claimed possesses the following advantages.

No high-current density is needed (10 to 20 amperes per sq. ft.), the solution works at ordinary room temperature; the throwing power is a revelation to chromium platers. Tubes 4" long and 1/4" diameter are plated inside and out when merely suspended loosely by a thin wire from the cathode rod.

Plating can be continuous as no striking is necessary. The pieces can be taken out during the process, examined, dried and buffed, then reintroduced into the plating vat, and still they will come out bright so that no finishing is necessary.

The solution is perfectly stable. Baths are said to have been in operation in some of the largest plants in England for over six months and are still giving entire satisfaction, and one bath has now worked for over two years. Existing plants can be adapted to use the process at comparatively low cost.

The company marketing this solution is Electrochemical Installations, Ltd., 6 Moreton Road, South Croydon, Surrey, England.

New Aluminum Furnace

R. Lavin & Sons, Chicago, Ill., aluminum and brass smelters, have completed a new developed aluminum smelting furnace which is said to be one of the largest in the United States. Its maximum capacity when fully charged is 75,000 pounds of aluminum, with an average charge of 48,000 to 50,000 pounds.

The design uses multiple chambers which maintain a strictly deoxidizing atmosphere and constant heat control. An automatic pouring device completes six ingots at a time at intervals of approximately twenty seconds and empties the charge in two to three hours.

The advantage of large heats of aluminum is that casting producers are able more fully to standardize their production. A 75,000 pound heat is all uniform since it is made in one lot.

Bonderizing—A Base for Finishes on Steel

By A. R. PAGE

Kelsey & Hayes, Ltd., Dagenham, England

The Parker Rust Proof Company of America, with headquarters in Detroit, Mich., has developed a new process for priming or acting as an undercoat, for paint, lacquer or enamel on steel and iron.

On account of the fairly long time of immersion necessary in the Parkerizing solution, where large mass production is carried out, the Bonderizing process has been developed, by which means the conversion of the steel surface into insoluble basic phosphates, can be effected in 7-10 minutes. It has been found that steel surfaces which have been cold rolled and therefore superficially hardened by cold work are somewhat difficult to attack, and that is why the Parkerizing process occupies about 60 minutes' immersion. The Bonderizing solution effects the change in about a sixth the time, and therefore is eminently suitable for the treatment of such articles as mudguards, motor car wings, rims, etc., on the conveyor principle. Parkerizing can be accelerated by using a sand or shot blasted surface, but Bonderizing eliminates the necessity for this expensive process.

There is a fundamental difference between the two allied processes. Parkerizing has a rust proofing value which Bonderizing does not claim. The latter is considered as a chemical primer, a base for paint, lacquer or enamel, but it does not lend itself in any way to any of the Parkerized oil finishes previously mentioned.

The operations necessary in Bonderizing are practically similar to those in the Parkerizing process. The solution is made up in a similarly simple way, except that initially a solution of Parco Powder is made up very nearly to the necessary strength, by the addition of a small amount of Bonderite Powder. As the solution weakens during use, the strength is maintained solely by the addition of Bonderite Powder, so one can look upon the original Parkerizing solution as the basis.

The various stages in the process can be enumerated as follows:

- (1) Degreasing either (a) in trichlorethylene, or (b) in an aqueous alkaline solution.
- (2) Rinsing in clean hot water if an alkali cleaner is used.
- (3) Bonderizing in a nearly boiling solution of Bonderite solution for 7-10 minutes.
- (4) Hot rinsing in clean hot water.
- (5) Drying out in a heated oven.

The treated articles are now ready for covering with paint or enamel by either the spray or dip methods.

The Bonderizing solution should be contained in a steel tank, and provision made so that the temperature of the solution can be kept at 208-210° F. This is best effected by fitting a series of steam coils spaced on the side walls. Any sediment which forms during the process can then settle freely to the bottom of the tank, and this facilitates cleaning out. A deposit of scale gradually forms on the sides of the tank, but this is unimportant. What is important, however, is the deposit which gradually forms on the heating coils. This, as it gets thicker, tends to impair the heat transference to the solution. Therefore, the coils should be arranged so that they are easily removed for cleaning, and it is recommended that they should be of brass, which does not scale up as rapidly as steel, and they are much more easily cleaned.

After a considerable amount of research, it has recently been found that the use of an endless solid drawn brass tube is advantageous. If the coil is allowed as much freedom as possible, so as not to restrict expansion and contraction, very little scale trouble is experienced.

The stock solution is made up to a definite strength by dissolving Parco Powder (manganese dihydrogen phosphate) in water, and then adjusting the final strength by the addition of "Bonderite Powder," which is essentially Parco Powder containing the accelerator. The strength of the solution is determined by titrating 10 ccs., which is removed by means of a pipette, with deci-normal sodium hydroxide, using phenolphthalein as indicator. By this

means, the total content of phosphate radicle is determined. For convenience, the strength of the solution is denoted by "points," that is, the number of ccs. of N/10 sodium hydroxide required to neutralize 10 ccs. of solution. It is recommended that, initially, the solution made by dissolving the Parco Powder should give 26 points. The final adjustment is now made by the addition of "Bonderite Powder" until the strength reads 29-30 points. After a good boiling to effect complete solution of the powders, the mixture is then ready for use.

Immersion of the steel articles occupies about 10 minutes, after which they are removed, well washed in a hot water rinse or spray, and then finally dried out in a heated oven. The latter is imperative in the case of articles which possess seams or overlapping metal joints.

The surface of the steel will now be found to possess a matte finish, which is of a plum color. When a bath is new, it is very often found that a loosely adherent powder exists on the treated surface. This should be removed by wiping, but, in time, when the solution has been thoroughly worked, wiping will be found unnecessary.

After about six weeks' use, the sludge and deposit at the bottom of the tank accumulates to such an extent that it is advisable to clean out the tank. Provision should be made for the Bonderizing solution to be held in a storage tank meanwhile.

The strength of the solution is not the only important factor for successful working. The temperature also is important, and should be maintained at 208-210° C. Careful attention should be given to the method of heating the solution. For small tanks, heating by gas can be employed, but in large tanks the use of steam coils made of brass is the best practice, providing the coils are kept free from scale. Electric immersion heaters also are satisfactory in any locality where power is cheap.

The use of live steam is decidedly unsatisfactory, except as a booster in starting up a plant, owing to the continual dilution of the solution by condensation.

As stated previously, the Bonderized surface should present a plum-colored dull matte appearance. Should the surface be crystalline and sparkling, this indicates that the degreasing process, prior to rustproofing has not been perfect, due to the incomplete removal of alkalies in the rinsing operation.

It very often happens that when a bath is new, the articles are covered with a loose, non-adherent deposit. This indicates that the phosphate layer is thin and of poor quality.

It has been found that the best results are controlled by the ratio of free acid to total phosphate in solution. This ratio can be easily and simply found by titrating 10 ccs. of the solution with deci-normal caustic soda, using both Phenolphthalein and methyl orange together as indicators. On titrating, the first color change due to the methyl orange gives the number of ccs. of alkali necessary to neutralize the free acid present, while complete neutralization denoted by the pink color of the phenolphthalein gives the total alkali required to react with the total phosphate present. The ratio of free acids to total phosphates should be at least 1 to 6. If the ratio drops to, say, 1 to 5, "smudge" will be produced. Should this condition exist, i.e., the amount of free acid is excessive, sodium hydroxide or carbonate should be added to the bath, to effect a partial neutralization. It has also been found that if this ratio is kept at above 1 to 6, "smudge" is never produced and the speed of the reaction is increased.

A simple and convenient test for ensuring that the Bonderized surface is adherent, is to rub the article with steel wool. If the reaction has been satisfactory, the metal should, after rubbing, have a polished grey appearance. If the bright steel is laid bare, the deposit is thin.

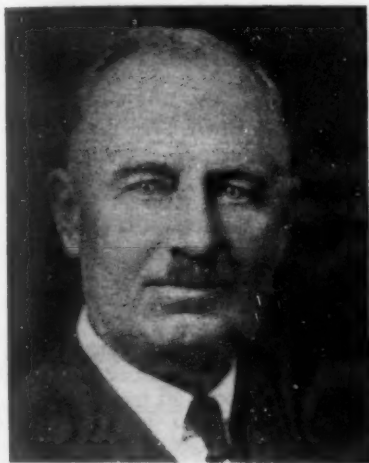
Naturally, the best test for Bonderized work is the practical corrosion test, after painting or enamelling, either in the salt spray or in the atmosphere.

Personals

John Harsch

John Harsch, head of the John Harsch Bronze and Foundry Company, Cleveland, Ohio, this year celebrates the completion of his fiftieth successful year as a non-ferrous foundryman. Congratulation are due him—and are coming to him—from foundrymen and other friends in business and industry throughout the country.

Mr. Harsch was born in Chicago, Ill., shortly after the Civil War. His father was a molder, and John was apprenticed to



JOHN HARSCH

the foundryman's trade at 13, with the Reedy Elevator Company, Chicago. As a journeyman he worked in a variety of foundries, his constant desire being to improve his technical knowledge. He learned the complex arts of iron and steel founding, non-ferrous work, and numerous other lines of foundry activity, including ornamental and statuary casting.

Mr. Harsch had charge of the Winslow foundry at Chicago for nine years as his first executive position. There the work was largely architectural casting. Then he went to Cleveland, to take charge of the W. S. Tyler Company's foundry. After twelve years there, he went into business for himself, setting up a small foundry in Cleveland's east side. Gradual expansion followed, due to Mr. Harsch's peculiar combination of business acumen and wide technical knowledge. The war brought the firm a great deal of business which it was

especially fitted to handle, not because of actual facilities, but rather largely due to Mr. Harsch's wide experience and great competence. This business made it necessary to provide the extensive plant in Cleveland's west side which the Harsch company operates today. It is of interest that the Harsch company is one of the few in the industry,—or in any industry, one might say—which is running at a fair rate and making profits today.

With half a century of activity in the foundry "game" behind him, Mr. Harsch continues in active charge of his company, assisted by two sons who are apparently intent to keep up the Harsch family tradition as foundrymen. One is in the office, the other in the shops. Each has his responsibilities, but John Harsch expects to continue as "big boss" indefinitely. Admitting that the first fifty years are the hardest, he doubtless wants to see what the second fifty will be like.

W. C. Packard has been appointed sales manager of the Standard Sand and Machine Company, Chicago, Ill., producer of sand handling and conditioning equipment.

William J. Meinel has been elected vice-president and general manager of Heintz Manufacturing Company, Philadelphia, Pa., maker of pressed metal products. He was formerly vice-president in charge of operations for the E. G. Budd Manufacturing Company.

Charles J. Gros, prominent in the brass foundry business in the Philadelphia, Pa., area for the past 20 years, has joined the Barry Bronze Bearing Company, Camden, N. J., as sales manager. The company has been specializing in bearing alloys for four years. It will now add to its line aluminum, brass, bronze and pure copper castings ranging in weight from one to 1,000 pounds. It operates a complete non-ferrous foundry.

Charles H. Marshall, until recently a member of the technical staff of The Bell Telephone Laboratory, Inc., has joined the staff of Lucius Pitkin, Inc., New York City, consulting chemists and metallurgists, as materials engineer. Prior to his service at the Bell Laboratories, Mr. Marshall had been in charge of the physical and mechanical laboratories of The Westinghouse Electric and Manufacturing Company.

Equipment and Supply Catalogs

Aluminum Solder. Alumaweld Company of New York, 79 Madison Avenue, New York City. Leaflet.

Chemicals. McGean Chemical Company, Keith Building, Cleveland, Ohio. Complete list of products.

Grinding Wheels. Norton Company, Worcester, Mass. Folder on what to

specify for various grinding purposes.

Motorpumps. Ingersoll-Rand Company, Phillipsburg, N. J. Pumping units with built in motors, for various uses.

Polaricode. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Super-speed supervisory control.

Blooming Mill Equipment. United Engineering and Foundry Company, Pittsburgh, Pa. Bulletin A-701; 36 pages, illustrated.

Furnaces. W. S. Rockwell Company, 50 Church Street, New York City. Bulletin 340 on bright annealing, bright silver soldering, bright copper brazing, electric and fuel.

Glasgow. Development Board for Glasgow and District, 72 St. Vincent Street, Glasgow, C.2, Scotland. A fine book showing the advantages of Glasgow for industrial projects, etc.

Welding Electrodes. Metal & Thermit Corporation, 120 Broadway, New York City. Illustrated brochure on application of "Murex" mineral coated electrodes for welding ferrous metals. Illustrated.

Head and Eye Protection Equipment. Chicago Eye Shield Company, 2300 Warren Boulevard, Chicago, Ill. Complete catalog and price list; includes information for protection of head and eyes against all industrial hazards.

Copper and Brass Products. Revere Copper and Brass, Inc., 230 Park Avenue, New York City. Complete semi-annual catalog, with larger page size than hitherto. Well arranged and indexed for ready reference. Contains many conversion tables and other valuable data.

Obituaries

Dr. George K. Burgess

Dr. George K. Burgess, director of the United States Bureau of Standards, Washington, D. C., died of cerebral hemorrhage July 2, 1932. He was 58 years old, and had been with the Bureau since 1903.

Born at Newton, Mass., he graduated from M. I. T. in 1896, and went to the Sorbonne at Paris, where he attained the doctorate. Starting as associate physicist, he developed the Bureau's Division of Metallurgy, which was established in 1913. He was widely known in metallurgical circles, and performed a vast amount of research in metallurgy. He was a member of the Institute of Metals Division, honorary member of the American Foundrymen's Association, and many other scientific and industrial bodies.

Col. Weston Jenkins

Col. Weston Jenkins, an official of Revere Copper and Brass Company, Rome, N. Y., died suddenly on July 8, 1932. He was a prominent Rome resident, and commanded an infantry battalion in the World War. Mr. Jenkins was a native of New York. For some years before 1911, when he went to Rome, he was connected with the iron industry in Pennsylvania.

Joseph L. Sweet

Joseph L. Sweet, a leading jewelry manufacturer of Attleboro, Mass., for 50

years, died July 21, 1932, at his home there. Mr. Sweet had been president of R. F. Simmons Company since 1890. Born in Mansfield, Mass., he joined the Simmons company at 23. Soon after he went into the jobbing business for himself, and later was admitted to membership in the Simmons company. He was active in civic and philanthropic affairs, and was credited with benefactions totaling \$250,000 to Sturly Hospital, Attleboro. His son, Harold E. Sweet, was associated with him in business and survives him, as does his widow.

George W. Millen

George W. Millen, treasurer and a director of the Clayton and Lambert Manufacturing Company, Detroit, Mich., producers of fire pots, blow torches, metal stampings, etc., died in June at Ann Arbor, Mich. He was 68, and very widely known in the metal trades. He was active in a number of other lines, also.

Abraham Symansky

Abraham Symansky, president and owner of Troy Casting Company, Troy, N. Y., iron and brass foundry, died July 10, 1932, following surgery. He was a native of Troy.

Frederick H. Crossthwaite

Frederick H. Crossthwaite, founder and former president of the Hartford Wire Works, Hartford, Conn., died May 21, 1932, of a heart attack. He was 82. Born in London, he migrated here and founded the wire works in 1870. In 1927 he sold it to Henry F. Hall for \$300,000 and retired.

W. R. B.

John S. McCormick

John S. McCormick, president of J. S. McCormick Company, Pittsburgh, Pa., foundry supply dealer, was killed in an automobile accident June 25, 1932. He was 67, and formerly was a prominent Pittsburgh foundryman. He had been identified with the industry for 40 years. He was one of the founders of the American Foundrymen's Association, and he served on its executive committee for many years. Mr. McCormick was a director of a fire insurance company and was prominent in civic and philanthropic affairs in Pittsburgh.

Emerson M. Williams

Emerson M. Williams, secretary-treasurer of the Standard Alloy Company, Cleveland, Ohio, died July 16, 1932, in his thirty-fifth year. He had been with the company for five years.

Paul Retzlaff

Paul Retzlaff, foundry superintendent for the Milwaukee Valve Company, Milwaukee, Wis., brass foundry and finishers, died of heat prostration July 19, 1932, when the temperature there rose to 98. Mr. Retzlaff was 48, and had been connected with the company for 25 years. He is survived by his widow and four children.

News of Associations and Societies

Pewter and Hollow Ware Manufacturers' Association

A. Kadison, of the Continental Silver Company, New York City, was elected president of the Pewter and Hollow Ware Manufacturers Association, Inc., 11 West 42nd Street, New York City, at its first annual meeting on July 12th, at New York. Benjamin Schwartz, trade relations counsel of the Association, submitted the following program for the elevation of the quality standards, which was approved by the Association: The elimination of certain unprofitable items in various lines; the use of heavier weights or gauges of metals to improve the standard items; the use of a quality seal by the members of the Association to include the words "Quality Pewter—Free from Lead"; the registration of original designs in pewter ware, and an arbitration machinery to prevent piracy of designs; the bonding of the members to guarantee observance of the quality standards.

L. J. Tavener, representative of the International Tin Committee of London, offered the co-operation of his Committee in connection with research and the development of wider uses and markets for pewter ware.

Other officers elected at the meeting include the following: Alexander Karsh, of Keystone Silver Corporation, vice-president; L. Garroway, Cromwell Silver Manufacturing Corporation, secretary; Louis Mautner, Mautner Manufacturing Company, treasurer. The members of the board of directors, in addition to the officers, are: Jacob Cantor, Crescent Silverware Company; Louis Schnitzer, Western Silver Novelty Corporation; S. Spitzer, Federal Silver Company; and Joseph Friedman, Friedman Silver Company. All the firms mentioned are in New York City.

Chemical Society

A symposium on "The Physical Chemistry of Metals" will be held by the Division of Physical and Inorganic Chemistry of the American Chemical Society 419 Fourth Avenue, New York City, at the Society's eighty-fourth meeting at Denver, Colo., August 22-26. Among those who will read papers, according to the announcement by Prof. H. H. Willard of the University of Michigan, chairman of the Division, are:

A. Wachter, Johns Hopkins University, "Thermodynamics of Metallic Solid Solutions"; G. L. Clark, University of Illinois, "X-Ray Analysis of Metals and Alloys"; Anson Hayes, American Rolling Mills Company, Middletown, O., "Some Applications of the Fundamental Theories of Metals and Alloys to Practical Manufacturing Problems"; W. M. Latimer, Uni-

versity of California, "The Use of Ionic Entropies in the Determination of the Electrode Potentials of Metals"; Alexander Goetz, California Institute of Technology, "The Influence of Small Impurity Concentrations on the Physical Properties of Metal Single Crystals."

Two symposia, one on "Industrial Coatings Related to Paint and Varnish," and the other on "Primers and Protective Coatings for Special Metals," will feature the meetings of the Division of Paint and Varnish Chemistry. Harley A. Nelson, research chemist, New Jersey Zinc Company, Palmerton, Pa., is chairman of this Division.

Ornamental Iron, Bronze and Wire Manufacturers

The Federal Trade Commission will hold an open meeting of fabricators of ornamental iron, bronze and wire products, including light structural steel, at Hotel Riverside, Cambridge Springs, Pa., October 3, 1932, for the discussion of trade practices and adoption of trade rules.

This conference was proposed by the National Association of Ornamental Iron, Bronze and Wire Manufacturers, 1331 G Street, N. W., Washington, D. C. It is to be an all-industry conference, and not strictly an association affair. Commissioner C. W. Hunt of the Federal Trade Commission, will preside, assisted by Judge George R. McCorkle, and the entire industry will be invited. Local associations throughout the country are appointing committees for consideration of abuses in the industry, and formulation of rules to eliminate them. Suggestions from all members of the industry will be carefully considered in August, so that tentative rules can be proposed early in September for consideration of the industry prior to the conference.

The conference will not be limited to principles developed in advance. Additional proposals will be presentable from the floor.

The Trade Practice Conference Committee of the Association has suggested four points relating to elimination of detrimental price cutting; incomplete and ambiguous bidding; bargain counter bidding; selling below own cost.

Institute of Metals

The Institute of Metals, Victoria Street, London, S.W.1, England, will meet with the British Iron and Steel Institute, September 12 to 15, at London. Papers scheduled deal with metal corrosion, engine valves, nickel iron, nickel and alloys, castings, hot-dipping, scale removal, silver, aluminum, beryllium-magnesium, lead-tin, alpha brass, silver-copper.

Industrial and Financial News

Brass Ingot Statistics

Combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., for June, 1932, amounted to 1,920 tons, as against 1,707 tons in May.

On July 1st, unfilled orders for ingots and billets on books of the members amounted to 18,186 net tons, as against 17,760 net tons June 1.

Metal Developments

SILVER is utilized in sterilization of water by a process which is attracting considerable attention in Germany, the Department of Commerce reports. An electrical firm there is marketing a device for domestic and traveling use which is said to require no parts or servicing for a lifetime, being charged with sufficient silver to sterilize 250,000 gallons of drinking water, and last-

ing longer than the average span of human life. The process is said to be applicable also to city water systems, ice plants, pools and other large scale uses of water.

Corporation Reports

Bohn Aluminum and Brass Corporation, Detroit, Mich.: net loss of \$73,964 after charges for first six months of 1932, against net profit of \$925,557 for same 1931 period.

International Silver Company, Meriden, Conn.: net loss of \$401,855 for second quarter of 1932, against net losses of \$461,808 the preceding quarter and \$120,595 the second quarter of 1931.

General Cable Corporation, New York: net loss of \$864,371 for second quarter of 1932, against net losses of \$850,169 the preceding quarter and \$575,643 the second quarter of 1931.

Parker Rust Proof Company, Detroit,

Mich.: profit after charges but before Federal taxes, for second quarter of 1932, \$132,710, against profits of \$96,116 the preceding quarter and \$199,033 the second quarter of 1931.

Reynolds Metals Company, New York, estimates net profit for first half of 1932 at \$505,000 after charges, as against \$809,520 for same 1931 period. Company declared 25 cents quarterly dividend, payable August 15.

Incorporations

Western Products, Inc., Newcastle, Ind.; automotive accessories, builders' hardware, etc.; 1,000 no par shares; by C. J. and A. Stetler and R. C. Steffen. **Orilium Corporation, Ltd.**, Toronto, Ont.; metal working, nonferrous foundry, finishing, plating, etc.; \$200,000 no par shares; by William E. Gill, Toronto.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

AUGUST 1, 1932.

While officials of the companies involved deny that anything has occurred to give ground for belief that a permanent recovery is here, there have been signs during the past month that business is on the up-grade in the local metal factories.

Waterbury Clock Company for the past three weeks has had some departments working six days a week, including Saturday afternoons, something that has not occurred for over two years. The officials, however, say that the improvement is probably only temporary, and due solely to the receipt of a few special orders. Many of the old employees who were laid off months ago have been taken back. Orders for wrist watches and electric clocks are chiefly responsible. The company is also making a new device for electrical refrigerators called "Frost Off."

The tool departments of the **Waterbury Button Company** are working 20 per cent more time than a few weeks ago. They are making tools for customers as well as for their own use. The tools for customers are for manufacture of an unexplained new line of articles, and the tools being made for the button company itself are expected to lead to an increase in manufacturing activity. The average working time for the tool departments is now five days a week,

and four days for the other departments.

Waterbury Manufacturing Company, branch of **Chase Companies, Inc.**, is reported to have received many new orders recently, and several departments are working more hours weekly than they have for some months.

French Manufacturing Company, branch of the **American Brass Company**, is reported to be slightly busier.

Officials of all the companies mentioned above warn against undue optimism, however, as they believe the present condition is a temporary one, due to demand from customers that orders be finished and shipped immediately.

Another sign of improvement is the fact that the **Mutual Aid Committee**, which provides work or aid for those out of regular employment, has for a month received no applications for relief from anyone recently laid off by the local factories. It is still caring for as many as before, and still gets new applications, but those applying have been out of work for a long time. Consequently, it is evident that there have been no additional lay-offs, recently. Also, some who were on its list have obtained regular employment.—W. R. B.

Connecticut Notes

HARTFORD — **Royal Typewriter Company** is putting out a new portable model to sell for half the present price. It involves a revolutionary type of key-

board, and is designed for those who have not learned to typewrite. It has already resulted in increasing the payroll \$5,000 a week, and officials say it will mean an increase of \$50,000 a week within a short time.

TORRINGTON — **Fitzgerald Manufacturing Company** has formed a Canadian subsidiary called the **Canadian Fitzgerald Company**, and has leased a large factory in Toronto for Canadian and English trade.

W. R. B.

Providence, Rhode Island

AUGUST 1, 1932.

The Rhode Island Tax Commissioners' annual report of corporations liable to taxation on corporate excess is in view of the depression, of more than usual interest. Chief among those removed from the list is **Brown & Sharpe Manufacturing Company**, which had a corporate excess of \$5,180,225 in 1930, and \$3,596,525 last year, but only \$3,415 this year. **Nicholson File Company** remains third largest taxpayer on the list, although its excess is reduced from \$4,448,057 in 1931 to \$3,774,906 this year.

The tax commissioners point out that "the decrease does not reflect the business conditions accurately. There are a number of corporations in very strong financial condition, which show a decided falling off as revenue producers; they have liquidated their inventory and invested their returns in tax-exempt securities and in addition to this some have temporarily invested a considerable amount of cash usually required for

capital in tax-exempts, thus still further reducing their taxable corporate excess very materially. Business conditions cut sharply into the amount of corporate excess of textile, electrical, all branches of metal trades, machinery and jewelry corporations."

Among corporations assessed on corporate excess of \$100,000 or more at the rate of \$4 per \$1,000, are 31 concerns identified with the metal trades and coordinate industries. These have a total corporate excess of \$13,246,943.68, upon which they will be required to pay taxes amounting to \$52,387.14.

Fire, followed by a terrific explosion, wrecked the mixing room of the **Charles S. Williams Lacquer Company** at 217 Chapman Street one morning last month, sending one man to the Rhode Island Hospital. Three persons sustained serious injuries. An employe was doing some painting in the basement when a gas flame near by caused a sheet of flame to shoot up the stairway into the mixing room filled with chemicals used in the manufacture of lacquer. Two sides of the room, composed principally of metal windows, were blown out, and one edge of the roof was shattered and sagged.

Frank I. Storin has been appointed receiver for the **LaSalle Ring Company, Inc.**, 107 Steward street, Providence, on petition of **Giustino Tortolini**, a stockholder, following a vote by stockholders to institute receivership proceedings. Bond was fixed at \$25,000. The petition showed that the assets and bank deposits of the concern are under attachment in a suit brought by **Roberts Manufacturing Company**.

Garvin-Poland, Inc., manufacturer of jewelry, has changed its name to the **Garvin Company, Inc.**

Renfel Company has been incorporated by **Frank Marandola**, **Guido Marandola** and **Mathew Marandola**; capital stock, 100 shares, no par.

Howard Kimball, **G. H. Kimball** and **Ivanhoe D. Billings** are the incorporators of **R. H. Kimball, Inc.**, chartered to manufacture jewelry; authorized capital, \$50,000 in 500 shares common stock at \$100 each.

A. T. Wall Company was awarded judgment for \$117 in Sixth District Court against the **Enterprise Pen Company**.

A second dividend of five per cent, amounting to \$8,150, is being paid to the creditors of **Wachenheimer Bros., Inc.**, manufacturing jewelers, 36 Garnet Street, by receiver **Horace M. Peck**, under court decree. First dividend was ten per cent, and amounted to \$16,300. After this dividend and allowances for the receiver and counsel, the court was told, the receiver will have a balance of more than \$7,000 on hand.

A. H. Schrieber and Company, Inc., manufacturing jewelers, has made an assignment to **Raymond W. Colley**. No estimates of assets or liabilities have been filed.

Plumbing and Heating Wholesalers of New England held their first annual convention at the Ocean House, West-

erly, last month, with more than 100 trade representatives in attendance. Principal speaker: **H. W. Thorndike** of the **F. W. Webb Manufacturing Company**, Boston. **M. W. Dennison**, president of the association, presided at the business sessions.

Judgment for \$171 against **Gertsacov Jewelry Company** has been awarded the **Standard Realty Company** in Sixth District Court.

Herbert D. Nickerson, treasurer, **Phillips Lead and Supply Company**, died suddenly June 28, in his 63rd year. The plumbing supply houses in Providence closed their offices during the funeral services.

Providence base works of **General Electric Company** has constructed a small addition to its Atwells avenue plant to provide housing for a supplementary conveyor unit. The addition cost about \$3,000. Bases for practically all the electric bulbs made in the United States are produced in the Providence plant. To aid in handling of the brass forms, conveyor systems, both belt and blower types, are used. The new unit is part of the inspection department, where, in ordinary course of production, two million lamp bases are made daily. The bases vary in size from the smallest used in automobiles, to bases for the large street lighting bulbs. Practically all the machinery at the base works is specially made, and most of the special machines are built on the premises.

W. H. M.

Springfield, Mass.

AUGUST 1, 1932.

Although the outlook in the 26 metal working firms in western Massachusetts is not bright, there have been neverthe-

less several advances in two or three industries which do not make the picture entirely colorless.

The **Moredrop Forge Company** and the magneto division of the **United American Bosch Company** have taken back several hundred of their former employes in view of the increased demands from the **Ford Motor Company** and expect that the men will be retained for some time. It is the hope of the officials of the company that by the time the orders which are keeping these men busy at the present time have been filled there will be demands from other concerns, but none of the leaders is willing to make a statement that there is any decided sign of hope in that line.

During the past month, conditions at the **Package Machinery Company** have been exceptionally good and although officers at the plant are unwilling to express great optimism over the future outlook they nevertheless indicate that in view of the orders which they have received during the past few weeks they are not looking for a letup in their business immediately.

At the **Van Norman Machine Tool Company** the automotive division shows considerable improvement. A few men have been recalled and the prospect for the immediate future is not displeasing.

Reports from the **Wico Electric Company** of West Springfield, the **Gilbert and Barker Company** and the **Baush Machine Tool Company** indicate that business is dull while at the **Westinghouse** plants in Springfield and Chicopee, the **Stevens Arms Company** of Chicopee Falls and the **Westfield Manufacturing Company** of Westfield conditions remain the same. In the last three mentioned plants there is no advance but a slight undercurrent of optimism tinges the reports from the factories.—G. B. Y.

Middle Atlantic States

Central New York

AUGUST 1, 1932.

A new industry was established in Utica last month, the **Krom-Kraft Company**. It is using a new process of chromium plating in the manufacture of various articles. It is headed by **George Shapland**, who designed a number of chromium clocks for the **American Emblem Company**. Articles include vases, nut bowls, tobacco humidors, pen and pencil holders and fruit dishes designed by Mr. Shapland. Facilities of the **Grand Chrome Company** in the Winship Building are being used by the company. **Krom-Kraft** is planning national sales and distribution of its products.

F. W. Young, vice-president and general manager of **Remington-Rand, Inc.**, in conference at Ilion with executives of the local plant, said he noted a slight improvement in business con-

ditions. Definite denial was made by Mr. Young of the report that the company would move the Syracuse plant to Ilion.

William F. Bossert, 84, founder of **Signal Accessories Company**, Utica, and also what is now the **Bossert Corporation** died early in July. He worked in the Thomas Edison laboratory when a boy and later in life handled many of the important electrical wiring contracts in Central New York.

William S. Murray, Utica chemist, head of **William S. Murray, Inc.**, producers of indium in commercial quantities, has filled a number of speaking engagements before Rotary, Lions' and other clubs in this area. He is contemplating running for congress.

Business in this area continues to drag along at a low level, with few optimistic or encouraging reports from any of the plants. E. K. B.

Trenton, N. J.

AUGUST 1, 1932.

There has been no change in the metal industry in Trenton during the past month. Some of the larger concerns like the **Trenton Brass and Machine Company** are working short handed and but few hours a week. The same condition prevails at the plant of the **Skillman Hardware Manufacturing Company**.

Remington-Reeve, Inc., a fountain pen and pencil concern, has been incorporated at Trenton with 2,500 shares of common stock by Arthur B. Reeve, of Trenton; Theodore C. Veefkind, of Pennington, N. J., and James J. Deegan, of 1440 Park Avenue, New York. The company will secure a factory building in Trenton and will manufacture pens and pencils.

The **Radio Condenser Company**, of

Camden, N. J., manufacturers of variable condensers and supplying a large Canadian market hitherto by export from their New Jersey plant, will establish a factory at Toronto, Can., to meet the Dominion requirements.

Following concerns have been incorporated here: **Harley Terrazzo Strip Company**, Collingswood, 100 shares, to manufacture brass and copper. **Rotenone Products Company, Inc.**, Morristown, 400 shares, manufacture chemicals. **A. H. Mathieu & Company**, Paterson, \$100,000, chemicals. **Heligraphic Research Corporation**, Bloomfield, \$100,000, chemicals.—C. A. L.

Newark, N. J.

AUGUST 1, 1932.

The **Pioneer Tool Company** has leased a factory building at 40 Orange Street, Bloomfield, and will use the same to

manufacture tools, cutlery and other hardware items. **Elechanan Echikson**, president of the company, has been connected for ten years with the **United States Cutlery Company**, of Belleville.

J. Frank Kavanaugh, former official of the **National Harris Wire Corporation**, Verona Avenue, is establishing a new plant for the manufacture of wire and wire products at 100 Coit Street, Irvington. Kavanaugh was formerly head of the **Standard Wire Alloy Company**, of Elizabeth. This concern was merged with the **National Harris** in March, 1930.

Following Newark concerns have been incorporated: **Porteus Electric Products, Inc.**, 1,000 shares, electrical appliances. **Derf Manufacturing Company**, \$10,000, manufacture spark plugs and electrical equipment. **Newark Metal Company**, 500 shares, metal products. **Maplewood Blade Company**, \$100,000, manufacture razor blades.—C. A. L.

Middle Western States — Pacific Coast**Detroit, Michigan**

AUGUST 1, 1932.

The metal industries are hovering around the bottom, although a few plants are operating on reduced schedules. The motor car industry, which absorbs more non-ferrous metal supplies than any other, has been a disappointment in recent weeks. It has not held up as expected, and at present only a limited number of the major concerns are in production. Most all of them, however, are planning some surprises in the way of new and cheaper cars for late summer or early fall presentation. It is expected these will stimulate the business for a few weeks, at least. But it is a desperate struggle to keep the public interested in new cars when money is so scarce. This naturally leads up to the unemployment situation, which has never been so acute here as at present. Persons trained in the non-ferrous metal trade are being urged to keep away from Detroit unless they have sufficient money to pay their way.

The plating industry is just as quiet as everything else. A few plants are in production, but largely on part time. A change for the better does not seem to be possible for a considerable time. Most of the work under way is for the motor car plants.

Manufacturers of plumbing and heating supplies are doing little, and there is only slight prospect of any immediate change for the better.

The **Marshall, Mich.**, plant of the **Wilcox-Rich Corporation**, working exclusively on a contract supplying Ford valves, has increased its payroll more than 10 per cent since July 1. Approximately 400 men are employed and have been for more than a month.

Although installation of its equipment is not completed, **Titan Electric Com-**

pany began operation of its new plant in Hillsdale recently. **Frank Roberts** is head of the organization, which moved here from Adrian. It manufactures small electric motors, bank geared motors, electric grinders, and electric pump jacks.

Announcement is made of a new motor car organization with an experimental plant at Belleville, near Wayne, Mich. It will produce a car following a variety of new engineering theories. It is expected to be on the market within the next few months. It is understood the power plant will be provided by Continental Motors, and that other parts will come from manufacturing concerns also in the Detroit area. **H. H. Day**, 45132 Van Born Road, Wayne, Mich., is general manager of the company, and **A. Van Orman** is secretary. The organization is incorporated under the name of the **Jaeger Motor Car Company**.

Several thousand former employees of **Hudson Motor Company** have been called back to work in Detroit in preparation for volume production of a new low-priced car. It is possible that as many as 10,000 workers will be on the Hudson payroll before August 1. It is announced that dealers already have placed orders for \$3,000,000 worth of the new type of cars.

Lee Brass, Inc., is a new concern at Marine City, Mich. The capital stock consists of 12,000 shares of no par value. Incorporator is **Meyrl M. Frost**.

Plans for placing on a production basis the new **Parks biplane**, manufactured by the **Hammond Aircraft Corporation**, are under way, it is announced. **Hammond** was incorporated last spring. Its first plane recently made its initial flight at the Ann Arbor Municipal Airport. The plane is a three-place job powered with a **Kinner 100-horsepower motor**. The test flights were pronounced pleasing.

F. J. H.

Toledo, Ohio

AUGUST 1, 1932.

Mid-summer months in this area are running true to form. Manufacturing has fallen to a low point, and there is nothing particularly promising in sight. Apparently some weeks still have to slide by before much activity starts in any line.

Manufacturers of automobiles and accessories are producing to some extent, but the volume is far below what was anticipated a few months ago.

The plating business is making only moderate progress.

F. J. H.

Wisconsin Notes

AUGUST 1, 1932.

Watson F. Barnhart and **George N. Sery** have organized the **George-Watson Manufacturing Company** in Milwaukee for the production of vegetable sprayers which throw a "mist" of water over a metal ball. The device is sold to grocers and vegetable and fruit markets. Nozzle tips are made in Milwaukee with special machines from Germany that drill a hole six thousands of an inch in diameter, the drill revolving 28,000 times per minute. The manufacturing of the sprayers is done at the **Milwaukee Valve Company**.

Business during June showed a noticeable increase over May for the **Milwaukee Metal Spinning Company**, according to **Theodore Salow**, president, and July has been very promising, he stated. The depression doesn't bother this concern much, Mr. Salow said. The reason for this is that in ordinary times, metal articles are also made by stamping processes which is faster if they are ordered in large quantities. Stamping doesn't pay in small quantities such as are ordered at

present and consequently the spinning company receives a considerable portion of the business, operating economically on small orders as they do.

Mr. Salow enjoys the distinction of having "spun" the nose plate for the propeller of the "Spirit of St. Louis," Col. Lindbergh's famous airplane just before the famed flight. The order was a "rush," Mr. Salow recollects and was finished just two days before the flight.

W. T. N. B.

Los Angeles, Calif.

AUGUST 1, 1932.

The **Ajax Manufacturing Company** has started in business at 1103 Riverside Drive, making metal parts for radios and other lines.

The **Acco Spark Plug Company** is now ready to manufacture spark plugs at 423 W. 18th Street. J. H. Allard is manager.

The **Flexo Manufacturing Company** has moved its factory from E. 12th Street to 1700 East 9th Street, having now 40,000 square feet of space, making all kinds of radiators, also condensers and parts of refrigeration.

The **Johnson Tractor Company** of Ridlands, has built a new factory to make a new carburetor and garden type of tractor.

The **Sunset Plumbing Fixtures, Inc.**, of this city, and the **West Coast Porcelain Manufacturers** of Willbrae, have combined as the **West Coast Sanitary Manufacturers**, in this city at 911 East 62nd Street. They will do a great deal of work in enameled iron. Roy C. Troeger is general manager.

The **Du Pont de Nemours Company** has taken larger quarters at 2424 East 8th Street, for auto and industrial finishes. W. J. Sohlinger is manager.

Pryne and Company, Los Angeles, Oakland and San Francisco are pushing ahead their house safes, mail boxes, etc., of brass, aluminum, bronze, etc.

The western district sales office of **Schleicher and Company**, 830 Market Street, San Francisco, is making a new motor truck light, made of platinum, gold, silver and glass. This light will send a beam through the fog, lessening danger.

The **Norton Manufacturing Company**, Oakland, has contract to make for the state, 2,265,000 sets of auto license plates for 1933.

The **Western Rotary Ventilator Company**, Los Angeles, and Detroit, is having a big run on its **Forbes Syphonair**, for air conditioning, made of galvanized iron, copper and aluminum.

The **Plumbing Sheet Metal Products Company**, here, has opened a building for the distribution of the Henkel "Edge-Lite" Corporation of Chicago.

The **Q. R. S. Neon Sign Corporation**, San Francisco, are building a new factory to make signs at 19th and Potrero Streets.

The **Capalite Reflecting Signal Company** has organized in the Phelan Building, San Francisco, to make street reflecting signals, signs, etc.—H. S.

Other Countries

Birmingham, England

JULY 12, 1932.

In the half year ended June there has been very little progress made in the non-ferrous metal trades. In every department consumers have bought from hand to mouth and industrial requirements have been at a low ebb.

A subdued demand continues in many of the brass foundries but it has been possible in some cases to record a fair output especially in lines which have benefited from tariffs and the changed conditions in regard to sterling. Reproduction brass previously imported from the continent is being made in Birmingham factories and articles of domestic ware sell at reasonable prices. The dullness of the building industry, however, has had a very depressing effect upon the market for plumbers and builders' brassfounders. Merchants have large stocks available against any sudden expansion and it must be some time before manufacturers are likely to be called on for further supplies on any substantial scale. In that section of the lock trade which uses large quantities of non-ferrous metal trade has been maintained on a moderate scale

but the factories are working below capacity.

Metals used in the cycle and motor industries are called for in fair quantities and preparations are in hand amongst some of the light car firms for the 1933 program.

In the aluminum hollow-ware trade business is comparatively good but manufacturers complain of the severe cutting of prices which tends to keep down profits.

The latest figures issued by the Ministry of Labour show that there are nearly two million persons unemployed in Great Britain and there was an increase of some 6,000 on the month. The position in the Midlands is that 241,709 are wholly unemployed or 24,542 more than the number in May.

At this season of the year there is a tendency for business to slacken in all departments owing to the holiday season. In the first week of August there will be a complete shutdown of all factories preceded by a rush to complete any unfilled orders. Under present conditions, however, there will in all probability be very little trouble in clearing up contracts.

—J. A. H.

Business Items — Verified

Pyrene Manufacturing Company, Inc., 560 Belmont Avenue, Newark, N. J., is preparing for the production of automobile tire chains at branch plant on Meeker Avenue.

Magnetic Manufacturing Company, Milwaukee, Wis., has appointed J. E. Harlow as Cincinnati representative, with offices at 7 West 6th Street. He will give engineering service in the southern half of Ohio, east and west through to Marion.

Alumaweld Company of New York, has announced the opening of a New York office at 79 Madison Avenue. The office will carry a complete stock of Alumaweld products and will also maintain a technical department to help in working out applications of the product.

R. G. Schoel, A. L. Callahan and J. G. Searls have organized the **Paranite Wire and Cable Corporation**, Jonesboro, Ind., and will handle wire cable and iron, steel and copper products. The following departments will be operated: tool room, tinning, soldering, brazing, and lacquering.

Sargent and Greenleaf, Inc., Rochester, N. Y., has taken over the assets, stock, tools, machinery and patents of Marproof Products, Inc., New York, according to an announcement by W. R. Hill, president. Their products comprise a line of leg sockets for desks, tables and stands.

Sholes, Inc., metal castings and chemical plant equipment, construction and machining of Monel metal, pure nickel and stainless steel has removed its general offices and shops from New

York to Orange, N. J. The following departments are operated: polishing, and grinding room.

Ferro Enamel Corporation, Cleveland, Ohio, reports 40 men attended its annual porcelain enamellers' training course, one week in June. Twelve were from Ohio State University, which gave them academic credit for it. J. E. Hansen, Ferro research engineer and author of the textbook used, was instructor. Many visiting lecturers were heard.

Youngstown Sheet and Tube Company, Youngstown, Ohio, has been experimenting with the new Steckel hot strip rolling mill controlled by patents of **Cold Metal Process Company**, of which A. P. Steckel is president. Among the materials rolled was pure nickel provided by **International Nickel Company**, New York. The mill is a new development.

United-Carr Fastener Company, 31 Ames Street, Cambridge, Mass., manufacturer of snap fasteners and kindred metal goods, has arranged with **Dudley Lock Corporation**, Chicago, for production of its products, including locks, padlocks, etc., in Canada, and will arrange for output at plant at Hamilton, Ont., where additional equipment will be installed.

Universal Foundry Company, Oshkosh, Wis., recently added equipment for production of brass and bronze commercial castings. Heretofore production was limited to gray and alloy iron, and aluminum castings. With this addition, they are in a position to furnish a complete line of patterns and commercial

castings up to 250 pounds each, in brass, bronze, gray iron or aluminum, it is stated.

Revere Copper and Brass Incorporated, New York, has opened a sales office in San Francisco at 1615 Russ Building. R. H. Binns, Jr., Pacific Coast Manager in charge of this office, was formerly assistant sales manager of the Rome Division of Revere and before it engaged in the metal distributing business. The new office gives Revere customers on the Pacific Coast and in other far-western states closer direct contact with the company.

Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio, has developed a separately excited motor-generator for B/J Aircraft Corporation, Baltimore, Md., for use in anodic oxidation of aluminum and its alloys. The work requires heavy current at all voltages from one to 50, irrespective of tank load, it is stated, and the Columbia equipment was found satisfactory for the work in working-condition tests made by the B/J company.

LaFayette Metal Products Company has just moved to 2910 Shattuck Avenue, Berkeley, Calif. A. Glauber, owner and manager, has invented and developed a select line of builders' hardware, including casement locks, screen hangers, full reversible window fixtures and others articles of this nature. All products are sold under the trade name "LaFayette." The plant occupies about 7500 square feet of floor space. The firm operates the following departments: brass machine shop, tool room, stamping, lacquering and japanning.

The New England Etching and Plating Company, 14 Free Street, Westfield, Mass., has moved to Holyoke, where it will occupy the plant at the corner of Race and Spring Streets, formerly the home of the old Barlow company. The building is three stories in height with about 2,600 square feet on each floor. It is planned to expand activities in other directions. The officers of the company are: W. J. Foerster, president; W. E. Foerster, secretary, and P. J. Balick, treasurer. The company operates the following departments: stamping, plating, polishing, and lacquering.

Nolte Brass Foundry Company, Springfield, Ohio, has acquired the Thompson-Owens Corporation of Toledo. Following rearrangement of finishing department in plant of the Nolte company at 27 W. Jefferson Street, now under way, all the modern machinery acquired from the Thompson-Owens Toledo plant will be moved to Springfield. George Thompson, who has had 40 years' experience in the business, is associated with the Nolte concern as superintendent of the finished brass brushing department. Officers are: A. B. Nolte, president; W. H. Pence, vice-president; A. H. Nolte, secretary, treasurer and general manager. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, grinding room.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

Copper

AUGUST 1, 1932.

In spite of the low range to which prices of copper have fallen demand continues very quiet. There were recent evidence on several occasions of a bearish character in European circles where copper was offered down as low as the equivalent of 4.60 cents per pound. Offerings in the domestic market are on the basis of 5¼ cents delivered Connecticut Valley, with sales of moderate quantities and one large transaction of 8,500 tons reported.

Production of copper is at a greatly curtailed rate, but large stocks of refined copper on hand prevent more favorable developments in the market. The situation would undoubtedly improve greatly if African developments are kept within reasonable bounds. Advices from that quarter report production costs of Rhokana Corporation at the equivalent of 4.1c a pound. A conservative policy by world producers is necessary to restore confidence based on sound principles and adjustments until prosperity returns.

Japanese producers recently entered the European market on the basis of 4.50c c.i.f. foreign ports of discharge. Consumers, however, display limited interest as they realize betterment cannot be expected in a situation like this by further depression of prices beyond all reason and common sense. These tactics unsettle confidence as current prices are no barrier to business, but further declines are thoroughly disquieting and tend to prevent trade recovery.

Zinc

As the result of pressure to sell and the easy tendency of the ore market prices of prime western slab zinc declined to 2.87c New York and 2.50c East St. Louis basis. Recent market action indicated poor consuming demand and a general weakening among producers of both ore and slab zinc. Actual business has been on a narrow scale throughout the entire month. Stocks are large and would probably be sufficient for requirements during the balance of the year. Curtailment in production of slab zinc has reduced output to the smallest in years, but the position of the metal continues to suffer from an accumulation of stocks.

Tin

British tin operations were active at advancing prices in June. The steady London advance made an impressive showing in view of the weakness and dullness of the other metal markets. Recent market action was stimulated by reports that a new pool had been formed by London operators to take over some 10,000 tons of tin from certain private interests and to keep such tin off the market until normal conditions prevail. Standard tin in London advanced from £108 per ton on

June 9th to £128 on July 14th, an advance of £20 per ton. The trading area in the New York market during the same period advanced from 18.65c to 21.20c for Straits tin. The July opening was at 20.25c and during the first half of month the quotation for prompt Straits tin advanced to 21.20c. Trading in the local market was limited, with subsequent easing of price of prompt Straits tin to 20.85c.

Lead

Signs of a definite downward market trend appeared at the beginning of the month. The opening was weak and irregular with offerings by various holders at recessions in the hope of stimulating business. On July 1 the American Smelting and Refining Co. announced 2.90c as the New York basis, but other sources were sellers at 2.75c New York. These tangible developments indicated clearly that the unsettled conditions would lead to lower price levels. Trading meanwhile was in moderate volume. The buying movement, however, was not strong enough to stem the downward drift of prices. Other reductions followed both in the eastern and western market. On July 18 all sellers appeared to be on the basis of 2.65c New York and 2.50c St. Louis. The June statistics were detrimental to market firmness as they showed stocks of refined lead of 180,460 tons on June 30, an increase of 6,531 tons compared with figures for end of May.

Aluminum

General demand for aluminum is only moderately active. This favored industry, however, succeeds in maintaining a steady market for all grades of virgin metal. Remelted and secondary aluminum remains quiet owing to slow demand from automotive industry and other manufacturers. The Soviet Union is reported to have recently placed an order for 8,000 tons of aluminum with Norwegian plants. New aluminum produced in the United States during 1931 amounted to 177,544,000 pounds, valued at \$37,284,000, as compared with 229,035,000 pounds, valued at \$50,961,000, produced in 1930.

Antimony

The turnover in antimony lately was exceedingly small in the absence of anything like urgent requirements. Price of Chinese regulus is quoted at 5 cents duty paid, but there are indications that this figure might be shaded 5 points on a bid for carload delivery. Present price is at the low point of year, but consumers are distinctly averse to purchase in substantial quantities.

Quicksilver

The market for quicksilver has recorded further declines in response to weak developments abroad and narrow activity here. The local quotation is down to \$52

per flask, and compares with \$56 a short time ago. Heavy stocks are carried in Europe. Current demand is quiet and buyers cautious.

Platinum

Platinum quotations are unchanged at \$34 to \$37 per ounce for the refined metal. Colombian output of platinum in 1931 amounted to 35,793 ounces, the lowest figure for the last ten years.

Silver

Transactions in the silver market have been limited, and the price movement has been at low levels. Dullness of conditions was expressed in a low for the year of 26½¢ on July 5. Only minor changes have taken place since, and the bullion market was a trifle steadier. Agitation continues for international co-operation by leading nations for making silver a basis of credit. It is claimed that England, France and the United States could formulate a program which would achieve great and desirable results of world-wide value. There has been no lack of discussion, but thus far achievement is negligible.

Old Metals

Fractionally lower prices controlled recent transactions in old metals. The declining trend in the European copper market resulted in an easier position here. Lead and zinc grades were also lower. Export buyers continue to show interest, but on a lower trading basis, which some holders appeared willing to take in order to effect realizations on material on hand. Domestic demand was light. Tin and aluminum grades were steady in keeping with the market for primary metal.

The Wrought Metal Business

By J. J. WHITEHEAD

President, Whitehead Metal Products Company of New York, Inc.

AUGUST 1, 1932.

The metals—copper and copper products, aluminum, lead, zinc, tin and nickel—have apparently ceased going lower. To be sure, some Japanese copper was offered abroad at the lowest price on record—4½ cents a pound. A prediction appeared in the "Daily Metal Trade" during the past few days advising that perhaps the price of copper before the year was over would be at 7 cents a pound. "The American Metal Market," for the first time since the fall of 1929, stated that it believed the worst was over, and that from now on slow improvement was not improbable. General business sentiment is better.

The copper industry has just brought out chromium plated copper cooking utensils which are on exhibition at the American Houseware Show at the Pennsylvania Hotel. They look fine, and might with proper exploitation result in quite a demand for copper. Copper channels for bus bars are now available, and will require in due course a considerable tonnage of the metal.

The demand for Monel metal sinks, now that they are lower in price, has increased. The spot welding process developed by

the Budd Manufacturing Company of Philadelphia makes possible the more extensive use of stainless steel which has 8 per cent nickel in it. Nickel-clad steel is being used in increasing tonnages. With the event of better times the demand for nickel is going to be very good.

Aluminum is making progress and is developing structural shapes for buildings, bridges, etc. Research in aluminum is sure to result in the increased use of this metal. Sheets are now being used for house roofing, truck parts, railroad car sections and in other places where the dead weight built into the structure or product is important.

The outlook everywhere is much improved, and the terrible possibility of impending chaos seems absent. It now behooves everyone to get busy and get the country out of the rut.

Ryan Expects Improvement

John D. Ryan, board chairman, Anaconda Copper Mining Company, New York, says he has observed a better business outlook the past few weeks which gives rise to hope of permanent improvement.

Daily Metal Prices for the Month of July, 1932

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	4*	5	6	7	8	11	12	13	14	15	18
Copper c/lb. Duty Free												
Lake (Del.)	5.50	.....	5.50	5.50	5.50	5.50	5.50	5.50	5.375	5.375	5.375	5.375
Electrolytic (Conn.)	5.25	.....	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
Casting (f.o.b. ref.)	5.125	.....	5.125	5.125	5.125	5.125	5.125	5.125	5.00	5.00	5.00	5.00
Zinc (f.o.b. St. L.) c/lb. Duty 1½¢/lb.												
Prime Western	2.675	.....	2.65	2.60	2.60	2.60	2.60	2.60	2.55	2.55	2.50	2.50
Brass Special	2.775	.....	2.75	2.70	2.70	2.70	2.70	2.675	2.625	2.625	2.575	2.575
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	20.50	.....	20.40	20.875	21.15	21.15	20.65	21.15	21.00	21.20	21.10	20.875
Pig 99%	19.625	.....	19.50	19.875	20.15	20.15	19.65	20.125	20.00	20.20	20.10	19.875
Lead (f.o.b. St. L.) c/lb. Duty 2½¢/lb.												
.....	2.60	.....	2.60	2.60	2.60	2.60	2.55	2.55	2.55	2.55	2.55	2.50
Aluminum c/lb. Duty 4¢/lb.												
.....	23.30	.....	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3¢/lb.												
Electrolytic 99.9%	35	.....	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	.....	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	40	.....	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2¢/lb.												
.....	5.00	.....	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Silver c/oz. Troy Duty Free												
.....	26.375	.....	26.125	26.125	26.375	26.50	26.875	26.75	26.625	26.875	27.00	26.875
Platinum \$/oz. Troy Duty Free												
.....	37.00	.....	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
	19	20	21	22	25	26	27	28	29	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.50	5.375	5.419
Electrolytic (Conn.)	5.25	5.125	5.125	5.125	5.125	5.125	5.125	5.25	5.25	5.25	5.125	5.213
Casting (f.o.b. ref.)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.125	5.00	5.038
Zinc (f.o.b. St. L.) c/lb. Duty 1½¢/lb.												
Prime Western	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.675	2.50	2.546
Brass Special	2.575	2.575	2.575	2.575	2.575	2.575	2.575	2.575	2.575	2.775	2.575	2.629
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	20.80	21.00	20.85	20.80	20.65	20.80	21.05	21.20	21.375	21.375	20.40	20.929
Pig 99%	19.75	20.00	19.85	19.75	19.625	19.75	20.00	20.15	20.375	20.375	19.50	19.925
Lead (f.o.b. St. L.) c/lb. Duty 2½¢/lb.												
.....	2.50	2.50	2.50	2.50	2.50	2.55	2.70	2.85	2.85	2.85	2.50	2.585
Aluminum c/lb. Duty 4¢/lb.												
.....	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3¢/lb.												
Electrolytic 99.9%	35	35	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2¢/lb.												
.....	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Silver c/oz. Troy Duty Free												
.....	26.75	26.75	27.00	26.75	27.00	27.00	26.75	26.75	26.75	27.00	26.125	26.70
Platinum \$/oz. Troy Duty Free												
.....	37.00	37.00	37.00	37.00	37.00	32.00	32.00	32.00	32.00	37.00	32.00	36.00

*Holiday.

Metal Prices, August 1, 1932

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 5.375. Electrolytic, 5.25. Casting, 5.00.

Zinc: Prime Western, 2.60. Brass Special, 2.675.

Tin: Straits, 21.50. Pig, 99%, 20.50.

Lead: 2.85. Aluminum, 23.30. Antimony, 5.00.

Duties: Copper, 4c. lb.; zinc, 1 3/4c. lb.; tin, free; lead, 2 1/4c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7 1/2%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.

Quicksilver: flash, 75 lbs., \$50. Bismuth, 85.

Cadmium, 55. Cobalt, 97%, \$2.50. Silver, oz., Troy (N. Y.) official price August 2, 27.00.

Gold: oz., Troy, \$20.67. Platinum, oz., Troy, \$32.00 to \$37.00.

INGOT METALS AND ALLOYS

	Cents lb.	Duty
Brass Ingots, Yellow	4 1/4 to 6 1/4	45%
Brass Ingots, Red	5 3/4 to 7	45%
Bronze Ingots	6 3/4 to 9 1/4	45%
Aluminum Casting Alloys	19 to 22	4c. lb.
Manganese Bronze Castings	16 to 35	45%
Manganese Bronze Ingots	6 to 10	45%
Manganese Bronze Forgings	21 to 35	45%
Manganese Copper, 30%	17 to 25	25%
Monel Metal Shot or Blocks .....	.. 28	25%
Phosphor Bronze Ingots	7 to 10	45%
Phosphor Copper, guaranteed 15%	9 3/8 to 15	3c. lb.
Phosphor Copper, guaranteed 10%	8 7/8 to 14	3c. lb.
Phosphor Tin, no guarantee	26 to 38	Free
Silicon Copper, 10%	17 to 35	45%
Iridium Platinum, 5%	\$39.00	Free
Iridium Platinum, 10%	\$40.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	3 1/4 to 3 3/4	Free
Light copper	2 5/8 to 2 3/4	Free
Heavy yellow brass	1 5/8 to 1 3/4	Free
Light brass	1 1/8 to 1 3/8	Free
No. 1 composition	2 5/8 to 2 3/4	Free
Composition turnings	2 3/8 to 2 1/2	Free
Heavy soft lead	1 7/8 to 2 1/8	2 1/8c. lb.
Old zinc	7/8 to 1	1 1/2c. lb.
New zinc clips	1 1/4 to 1 1/2	1 1/2c. lb.
Aluminum clips (new, soft)	9 to 10	4c. lb.
Scrap aluminum, cast, mixed	2 1/2 to 2 3/4	4c. lb.
Scrap aluminum sheet (old)	6 to 6 1/2	4c. lb.
No. 1 pewter	10 1/2 to 11 1/2	Free
Electrotype or stereotype	1 5/8 to 1 3/4	2 1/8c. lb.*
Nickel anodes	20 3/4 to 22 1/4	10%
Nickel sheet clips; rod ends (new)	23 1/4 to 24 1/4	10%
Monel scrap	5 1/2 to 9	3c. lb.

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective May 19, 1932.

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled	14 7/8c.	2 1/2c. lb.
Bare wire	7 1/2c.	25%
Seamless tubing	14 3/4c.	7c. lb.
Soldering coppers	15 1/4c.	45%

BRASS MATERIAL—MILL SHIPMENTS

	Net base prices per pound				Duty
	High Brass	Low Brass	Bronze		
Sheet	12c.	13 1/8c.	13 1/2c.		4c. lb.
Wire	12c.	13 1/4c.	13 1/2c.		25%
Rod	9 3/4c.	13 1/8c.	13 1/2c.		4c. lb.
Open seam tubing	19 3/4c.		21 1/4c.		25%
Angles, channels	19 3/4c.		21 1/4c.		12c. lb.
Seamless tubing	15 1/4c.		16 3/8c.		8c. lb.

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal	Wire and Rod
10% Quality	20 1/2c.
15% Quality	22 3/4c.
18% Quality	24c.
10% Quality	23 3/4c.
15% Quality	27 3/4c.
18% Quality	31 1/4c.

TOBIN BRONZE AND MUNTZ METAL

	Net base prices per pound.	(Duty 4c. lb.)
Tobin Bronze Rod		13 1/2c.
Muntz or Yellow Metal Sheathing (14"x18")		14 1/8c.
Muntz or Yellow Rectangular sheet other sheathing		14 1/8c.
Muntz or Yellow Metal Rod		10 3/4c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base) ...	35	Full Finished Sheets (base) 42
Cold Drawn Rods (base) ...	40	Cold Rolled Sheets (base) 50

SILVER SHEET

Rolled sterling silver (August 2) 30.25c. per Troy oz. upward according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb.	
	Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount ..	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price) ...	10.00 to 10.25	2c. lb.
Full Lead Sheet (base price)	6.00	2 3/4c. lb.
Cut Lead Sheet (base price)	6.25	2 3/4c. lb.

BLOCK TIN AND BRITANNIA METAL SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, August 1, 1932

ANODES

Copper: Cast	16½c. per lb.
Rolled, sheets, trimmed	14½c. per lb.
Rolled, oval	13½c. per lb.
Brass: Cast	14½c. per lb.
Zinc: Cast	.08¾c. per lb.

Nickel: 90-92%	41c. to 45c. per lb.
95-97%	42c. to 46c. per lb.
99% cast, 44c. to 48c.; rolled, depolarized, 45c. to 49c.	
Silver: Rolled silver anodes .999 fine were quoted August 2 from 30.25c., per Troy ounce upward, depending upon quantity.	

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	\$3.00/lb.	\$2.75/lb.	\$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 1	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	\$13.37 to \$13.80
14" 20 ply 64/68 Unbleached	21.60 to 22.65
11" 20 ply 80/92 Unbleached	17.00 to 17.55
14" 20 ply 80/92 Unbleached	26.37 to 28.00
11" 20 ply 84/92 Unbleached	21.69 to 21.90
14" 20 ply 84/92 Unbleached	35.37 to 36.15
11" 20 ply 80/84 Unbleached	21.69 to 21.90
14" 20 ply 80/84 Unbleached	35.37 to 36.15
Sewed Pieced Buffs, per lb., bleached	41c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14	Lead Acetate (Sugar of Lead)	lb.	10-11¼
Acid—Boric (Boracic) granular, 99½+ % ton lots	lb.	.04½-.05	Yellow Oxide (Litharge)	lb.	.12¾
Chromic, 75 to 400 lb. drums	lb.	.13 -.17½	Mercury Bichloride (Corrosive Sublimate)	lb.	\$1.58
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02	Methanol, 100% synth., drums	gal.	.41½
Hydrochloric, C. P., 20 deg., carboys	lb.	.06	Nickel—Carbonate, dry bbls.	lb.	.32
Hydrofluoric, 30%, bbls.	lb.	.08	Chloride, bbls.	lb.	.18
Nitric, 36 deg., carboys	lb.	.06-.06½	Salts, single, 300 lb. bbls.	lb.	.10½-.13
Nitric, 42 deg., carboys	lb.	.07-.08	Salts, double, 425 lb. bbls.	lb.	.10½-.13
Sulphuric, 66 deg., carboys	lb.	.02	Paraffin	lb.	.05-.06
Alcohol—Butyl	lb.	11.30-18.00	Phosphorus—Duty free, according to quantity	lb.	.35-.40
Denatured drums	gal.	.476	Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Alum—Lump, barrels	lb.	.03¾-.04	Potassium Bichromate, casks (crystals)	lb.	.08½
Powdered, barrels	lb.	.03½-.04	Carbonate, 96-98%	lb.	.06½
Ammonia, aqua, 26 deg., drums, carboys	lb.	.02¾-.05	Cyanide, 165 lbs. cases, 94-96%	lb.	.50
Ammonium sulphate, tech., bbls.	lb.	.03½-.05	Pumice, ground, bbls.	lb.	.02½
Sulphocyanide	lb.	.28-.37	Quartz, powdered	ton	\$30.00
Arsenic, white, kegs	lb.	.04½-.05	Rosin, bbls.	lb.	.04½
Asphaltum	lb.	.35	Rouge, nickel, 100 lb. lots	lb.	.25
Benzol, pure	gal.	.58	Silver and Gold	lb.	.65
Borax, granular, 99½+ %, ton lots	lb.	.02¾-.02¾	Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.05½
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55	Silver Chloride, dry, 100 oz. lots	oz.	.24½-.27¼
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½	Cyanide (fluctuating)	oz.	.31¾-.37½
Carbon Bisulphide, drums	lb.	.05½-.08	Nitrate, 100 ounce lots	oz.	.20¾-.23¾
Chrome Green, bbls.	lb.	.19	Soda Ash, 58%, bbls.	lb.	.023
Chromic Sulphate	lb.	.30-.40	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Copper—Acetate (Verdigris)	lb.	.20	Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Carbonate, bbls.	lb.	.14-.20	Metasilicate	lb.	.05-.06¼
Cyanide (100 lb. kegs.)	lb.	.39	Nitrate, tech., bbls.	lb.	.03¾-.07
Sulphate, bbls.	lb.	.0325-.0475	Phosphate, tech., bbls.	lb.	.03¾
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¾-.20¾	Silicate (Water Glass), bbls.	lb.	.01¾
Crocus	lb.	.15	Stannate	lb.	.20¾
Dextrin	lb.	.05-.08	Sulphocyanide	lb.	.30 -.45
Emery Flour	lb.	.06	Sulphur (Brimstone), bbls.	lb.	.02
Flint, powdered	ton	\$30.00	Tin Chloride, 100 lb. kegs.	lb.	.25½-.27
Fluorspar, bags	lb.	.04½	Tripoli, powdered	lb.	.03
Gold Chloride	oz.	\$12.00	Wax—Bees, white, ref. bleached	lb.	.60
Gum—Sandarac	lb.	.26	Yellow, No. 1	lb.	.45
Shellac	lb.	.32-.34	Whiting, Bolted	lb.	.02½-.06
Iron Sulphate (Copperas), bbls.	lb.	.01½	Zinc, Carbonate, bbls.	lb.	.11
Lacquer Solvents	gal.	.85	Chloride, drums, bbls.	lb.	.07½-.10
			Cyanide (100 lb. kegs.)	lb.	.38
			Sulphate, bbls.	lb.	.03¾